

THE
Indian Medical Gazette

A MONTHLY JOURNAL OF

Medicine, Surgery, Public Health, and General Medical Intelligence
Indian and European

EDITED BY

L. EVERARD NAPIER, M.R.C.P. (Lond.)

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PRESENTED
by
SETH K.L. MUNOT

Vol. LXXI

(Founded in 1865)

CALCUTTA
THACKER'S PRESS & DIRECTORIES, LTD.

1936

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OF

“THE INDIAN MEDICAL GAZETTE”

For the year 1936

[Original Article 'O.A.'; Mirror of Hospital Practice 'H.P.'; Editorial 'E.'; Special Article 'S.A.'; Medical News 'M.N.'; Commentaries 'Com.'; Current Topics 'C.T.'; Correspondence 'C.'; *Italics* signify Reviews; Reviews are placed under the name of the author; they also appear under the heading 'Reviews', where they are arranged according to subjects.]

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Original Articles

THE FEEDING OF INFANTS IN INDIA

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ARTIFICIAL FEEDING

THERE comes a period in the lives of most babies in India, as in other countries, when natural food must be abandoned.

Before embarking on the delicate task of changing from natural to artificial feeding, the mother or attendant must have a clear plan outlined and the following matters are for decision :

1. The choice of food.
2. The method of preparation.
3. The amount of food required in the 24 hours.
4. The capacity of the child's stomach, that is to say, the size of each feed.
5. The optimum interval between each feed.

Choice of food.—The best substitute is fresh cow's milk, modified or diluted according to the digestive capacities and needs of the infant. Cow's milk must conform to certain standards. It must be clean, for there are many sources of contamination, the milker's hands, dirty vessels, vessels washed with polluted water, dirty udders of the cow. The danger of transmitting tuberculosis from an infected cow to the infant is a real one and it must be remembered that a high proportion of the tuberculosis of infancy is bovine and may be attributed to milk-borne infection, though this danger in India is not so great as in England. Dirty milk, even if boiled, is still dirty, and the swarms of dead bacteria may set up intestinal irritation. In India today, owing to the difficulty in obtaining milk up to standard, dried milks such as Cow and Gate or Glaxo are extensively used with excellent results.

Of the physical properties, the fat content is most liable to variation. A series of analyses kindly supplied by Lieut.-Colonel A. D. Stewart shows that the fat content of the milk of individual cows varies as widely as from 3.7 to 6.9 and that in the cold weather the figure is generally higher. It is desirable, therefore, that the fat content of the milk chosen should be known.

The milk must have a good vitamin content. This will depend on the surroundings and feeding of the cow. The effect of feeding and sun-

light on the vitamin content of milk have peculiar application and importance in India. The vitamin content is poor when the cow is fed on dried fodder as it is in the plains in India in the hot weather. The sources of suitable supply are available in India. In large centres there are well run dairies under careful supervision, supplying milk of standard quality. There are those who prefer to keep a private cow, in which case the welfare of the animal must be carefully guarded. The cow should be inspected periodically by a veterinary officer.

Goat's milk.—In many parts of India, the milk of goats is used with success as a substitute for cow's milk. The goat is easily kept in the compound, and milked under supervision, but special care must be taken to frustrate its natural tendency to promiscuous feeding. The animal being less subject to tuberculosis than the cow, the milk may be given unboiled should circumstances demand.

The milk has approximately the same proportionate contents as cow's milk and is used in the same way, modified or diluted to suit the individual.

It will, of course, not be used where there is any suspicion of the existence of undulant fever.

The question now arises as to the form in which the milk is to be administered. For the healthy child there are three methods of feeding with cow's milk, the whole milk method, the method of adding water in gradually decreasing proportions according to the supposed digestive capacity of the child and, finally, the method of physiological feeding advocated by Dr. Eric Pritchard and many other pædiatristians, the proportions in the feed being brought as near to that of human milk as is possible.

Whole-milk feeding.—There are still advocates of the whole-milk method; their advocacy is based on two not very convincing grounds; the first, that it is impossible, by any form of modification, to produce a substitute really comparable to human milk, and the second, that the majority of infants do well, and that those who do not, must be placed in the category of delicate or difficult infants. It is true that many infants rise to the occasion and manage to thrive in spite of this rather drastic method, but in India the infant has much to contend with, and we cannot afford to add to his burden for we do not really know how far the seeds of disease in later life may be sown in early infancy by incorrect feeding. The graver defects will produce immediate results such as rickets and indigestion, but, of the more remote effects, it is not possible to speak definitely. This being the case, we are not in a position to take liberties with the nutrition and digestion, and a food cannot be pronounced absolutely satisfactory merely because there is no immediate protest.

Two methods therefore remain, the first, the method of dilution, whereby the protein content

is reduced to a figure within the digestive capacity of the infant, the fat is reduced, and the sugar is brought up to or higher than the original content by the addition of sugar of milk or cane sugar. This method is suitable for the hot weather.

The second, of which the aim is to so modify the milk by dilution and additions, that the composition approximates as nearly as possible to breast milk. This method gives excellent results in temperate climates and is suitable to hill stations and the cold weather of the North, but must not be attempted in the hot weather. On the contrary we must definitely abandon all idea of feeding babies according to European standards and should regard the proportions as protein 2, fat not more than 2 and carbohydrate 6 to 8 as being suitable, there being a lowered tolerance to fat and increased tolerance to carbohydrate provided that part is given as dextri-maltose, *e.g.*, Mellin's food.

The amount of food required.—The amount may be calculated in one or two ways. The first, by multiplying the weight of the child in pounds by a figure varying from $1\frac{1}{4}$ to $2\frac{1}{2}$ according to the prevailing temperature

TABLE I
According to weight (Patterson)

Weight of infant in pounds	Ounces of cow's milk	Ounces of water	Tea-spoons of sugar	Number of feeds
5	7	6	5	6
6	8 $\frac{1}{2}$	6	6	6
7	11 $\frac{1}{2}$	6	7	6
8	13	7	8	6
9	15	8	9	6
10	17	8	10	5
11	19	9	11	5
12	21	9	12	5
13	22	9	13	5
14	23	10	14	5
15	24	10	15	5

The figures given represent the requirements for 24 hours. In using the above table care should be taken that the infant is not receiving too high a quantity of fat, and should the milk be obviously rich, some portion should be skimmed off.

High dilutions in the early weeks, with gradual progress towards whole milk as the digestive capacity increases, are indicated.

TABLE II

According to age

Age	Dilution	Number of feeds in 24 hours	Quantity per feed	Average quantity of diluted milk in 24 hours	Quantity of sugar to be added to each feed	Quantity of cream to be added	Hours of feeding	
			oz.	oz.	Teaspoon	Teaspoon	a.m.	p.m.
2 to 7 days ..	1 to 3	8	1 to 2	10	$\frac{1}{4}$	..	6. 9.	12 3. 6.
1 month ..	1 to 2	6	2 to 4	20	$\frac{1}{2}$	$\frac{1}{4}$	do.	do.
2 months ..	1 to 1 $\frac{1}{2}$	6	3 to 4	27	$\frac{3}{4}$	$\frac{1}{2}$	do.	do.
3 months ..	1 to 1	6	4 to 5	32	1	$\frac{3}{4}$	do.	do.
4 to 5 months ..	1 to $\frac{3}{4}$	6	5 to 6	35	1 $\frac{1}{4}$	1	do.	do.
6 to 7 months ..	1 to $\frac{1}{2}$	5	6 to 7	38	1 $\frac{1}{2}$	1	6. 10	2. 6. 10
8 to 9 months ..	pure	5	7 to 8	40	1 $\frac{1}{2}$	1	do.	do.

of the atmosphere. The resulting figure will give approximately the number of ounces of breast milk or its equivalent required in the 24 hours. A simple method of calculation for the hot weather is after the figures of Hess, namely, that a baby requires $1\frac{1}{2}$ ounces of milk, one ounce of water and $1/10$ ounce of sugar for every pound of body weight. It is important to note that though the food requirements go down as the temperature of the atmosphere is raised, the requirements of fluid are increased so that the baby will require three ounces of fluid or more for each pound of body weight. The following tables will serve as a guide:—

HUMANIZED MILK.

Method 2.—The principle of this method is that we follow the instructions of nature and endeavour so to modify cow's milk that it may approximate in composition as nearly as possible to human milk. In practice this method has been found to be satisfactory but its use must be limited to temperate or winter climates. At first sight the imitation of human milk is simple. By diluting the milk till the proportion of proteid is that of human milk and then adding cream and sugar, we have what is known as humanized milk. Humanizing is a comfortable term, but it must not be forgotten that,

humanized milk is not identical with human milk.

Preparation

	oz.
Cow's milk of good average quality ..	10
Cream, 33 per cent (this is the average cream obtained by centrifugalization) ..	1
Sugar ..	1
Water to ..	20

The composition of this mixture is as follows:—

Protein, 1.75 per cent; carbohydrate, 7 per cent; fat, 3.5 per cent.

TABLE III

Average requirements of humanized milk (cold weather)

Weight of infant, lbs.	Total amount in 24 hours, oz.	Number of feeds in 24 hours
10	25	6
11	27½	6
12	30	6
13	32	6
14	34	6
15	36	5
16	38	5
17	40	5

Precautions.—1. It will be noted that no figures are given in the above table for very small infants. *The mixture is likely to be too rich in fat for very young babies* and recourse must be had either to a more dilute diet or the mixture must be predigested.

2. The method is quite unsuitable for the hot weather.

3. Artificial feeding should never start with full strength humanized milk, it is difficult for the infant to digest fat in whatever form in the same quantity and proportions as in human milk. The milk should be gradually strengthened as the child shows tolerance.

Alternative method of preparing humanized milk—top-milk method.—The term top-milk is applied to the upper layers of milk which has stood for some time and into which the main cream content has risen. Top-milk, by suitable dilution, can be converted into a food of balance closely approximating that of breast milk. One pint or one quart of fresh milk is placed in a glass douche can, surrounded by ice, or, if preferred, a convenient apparatus, Maw's milk humanizer, may be obtained.

The amount of cream which will rise to the upper layers will depend on the length of time of standing.

Taking a good average milk with fat percentage of 3.4 to 3.8, after four hours the composition of the top quarter will be:—Fat, 7 per cent; protein, 4 per cent; sugar, 4 per cent. The top quarter only is used, the lower three-quarters being syphoned off. This is diluted to half, with the resultant composition of protein, 2 per cent; fat, 3.5 per cent; and sugar, 2 per cent.

Sugar at the rate of 1 ounce to one pint of the mixture is finally added.

The resulting mixture may thus be compared to human milk:—

	Protein	Fat	Sugar
The mixture ..	2 per cent	3.5 per cent	7 per cent
Human milk ..	1.5 "	3.9 to 4 "	7 "

It is essential that the milk be stood on ice or kept in a refrigerator during separation.

The slightly lower fat content and higher protein content of the top-milk mixture are to be regarded as desirable.

POINTS COMMON TO ALL METHODS

The addition of sugar.—For the young infant, milk sugar which may be obtained from any chemist is desirable; it is identical with the sugar of human milk and is less likely to give rise to fermentative dyspepsia. With the increasing demands of older infants the amount of sugar required to maintain the balance amounts to two ounces. Many infants will not tolerate so large a quantity, which gives rise to intestinal fermentation, but half may with advantage be replaced by dextri-maltose, such as Mellin's food.

Addition of other factors.—Lecithin powder, grain 1, daily, in one bottle until such time as the child is old enough to take egg-yolk should be added (Pritchard).

Vitamin content.—As the sterilization of milk will have an adverse effect on the vitamin content, we should guard against any possible deficiency. Cod-liver oil contains an ample supply of vitamins A and D and may be administered in the form of an emulsion daily.

To replace the anti-scorbutic vitamin, orange juice, grape or tomato juice two to four teaspoonfuls daily may be given.

Vegetable soup.—The accessory food factors are required in minute quantities only, but are nevertheless essential to perfect nutrition. In order to ensure that there is no shortage of extractives or mineral salts in absorbable form, a soup made from vegetables and bone may with advantage be added to the diet, even as early as the fifth month. Such an addition will be found of particular value at the time of the appearance of the first teeth.

The following figures will be found of use:

1. The increase by five ounces of milk to a pint of the humanized mixture raises the protein content by 1 per cent, *e.g.*,

Milk 10 oz., water 10 oz.			
Composition: Protein,	Fat	Carbohydrate	
1.75	2	2.25	
Milk 15 oz., water 5 oz.			
2.75	3	3.4	

2. Every ounce of 33 per cent cream added to one pint of milk mixture raises the fat content by 1.5 per cent.

3. Every ounce of sugar added to the mixture raises the percentage by 5 per cent.

The second method of calculation is by the calorimetric method. When modifications are required to suit individuals, the method will be found a reliable guide.

At the same time, figures based on calculations cannot be taken as rigid. Just as in the quality of food, so in the quantity, allowance must be made for individuality. Requirements will depend to a large extent on the uses to which the food is put. Some will be burnt up to produce heat, so that the child will require only two-thirds or three-fourths of the cold weather allowance when it is hot. Want of attention to this point is responsible for many cases of digestive disturbance on the voyage out to India and on transfer from the hills to the plains.

The food value may be expended as energy, a vigorous kicking baby will require more than a lethargic one. The first experiments in sitting, walking and standing will make especial demands on the energy.

The food value may be expended in growth more rapid than normal. A small rapidly-growing baby will require more proportionately than a larger more slowly-growing one, and an infant building up after a wasting disease may require as much as 25 per cent above the average requirements for its age and weight.

The average size of the child's stomach is as follows:—

(Pritchard)

Age	At birth	Weeks				Months	
		2	4	8	12	5 to 6	10 to 11
Weight in lbs.	7	7½	8	9	10	13 to 14	18 to 21
Capacity in ounces.	1 to 2	1.5	2	3.37	4.5	5.75	8.14

The stomach is, however, to a certain extent an adaptable organ and the actual size will depend, within limits, on the usual size of the feeds. The normal stomach will easily accommodate one-sixth of the total requirements of food in the 24 hours, except in very young children.

In the maze of instructions and calculations, the real test of successful feeding must not be missed. The aim is to produce a happy healthy baby with a good digestion and showing a steady rate of progress. The successful feeding consists, not only in administering food suitable in quality, quantity and cleanliness, but a careful appreciation of the results and, if necessary, a judicious modification to suit the individual requirements.

The feeding tables are laid down for the average healthy baby, but it is impossible to provide one form of diet suitable for all babies.

Modifications will be necessary to suit the individual, and the diet must be made to agree with the child and not the child with the diet.

TIMING THE FEEDING

The question of the frequency of feeding is a matter which has excited much attention of recent years and there seems little reason to doubt that, with the introduction of more modern methods with longer intervals, there has been an improvement in the health of naturally and artificially fed infants. Above all *regularity is essential*, the child becomes trained to expect the meal at definite times and the stomach is fully emptied between each meal. The practice of feeding the child whenever he cries can only lead to ill health. *Night feeds are not necessary* unless the habit is contracted in early life, they disturb the rest of both mother and baby. The majority of babies thrive well on four-hourly feeds from the first, that is five meals a day; though there are some who require more frequent feeding in the earlier months.

The choice of the diluent to milk.—There are three substances commonly added to milk with a view to preventing the formation of a heavy curd in the stomach, which is such a serious obstacle to digestion.

Lime water.—One teaspoonful or so to each feed does undoubtedly prevent the formation of curd, but unfortunately causes constipation, and may, after prolonged use, set up intestinal irritation. The administration of lime water with a view to promoting bone formation is unnecessary and probably useless.

Sodium citrate added to milk in the proportion of two grains to each ounce of milk is of great service in tiding a delicate child over a period of indigestion, but it is not to be recommended as a permanent constituent of the diet. The action of sodium citrate is to inhibit the gastric digestion by neutralizing the hydrochloric acid of the gastric juice. Digestion is either postponed till the food has passed the stomach or the intestinal juices are enabled to regurgitate and act in the artificially alkaline medium in the stomach. This will reproduce one of four effects: (1) The acid barrier, always weak in infants, will be broken down and the way laid open to invading microbes. (2) The production of acid may be overstimulated and so the habit of overproduction, and acid dyspepsia, established. (3) The stomach misses the educational exercise of early infancy. (4) The initial stimulus to digestion throughout the alimentary canal is lost. Further, in certain susceptible children the administration of citrate gives rise to oedema.

Barley water acts mechanically and prevents the formation of a dense clot. At the same time, the introduction of unaltered starchy food into the dietary at this period is not altogether

desirable and the cereal action, to be discussed later, must not be overlooked.

Taken in all, the best diluent is boiled water. If the water be first boiled, and while still hot, the milk be added and well stirred, the heavy clots will not form.

Sterilization.—Owing to the changes and chances to which milk is subject, the occasions on which it is possible to advise the giving of raw milk are rare. Generally speaking, it is desirable to undertake some process of sterilization. Strictly speaking sterilization implies the destruction of all germs and the rendering of milk absolutely free from all living organisms. In practice this is not feasible, as some organisms, the spore-bearing groups, are so resistant that the amount of heat required to kill them would so materially alter the character of the milk as to render it unfit for consumption. The majority of disease-bearing organisms are, however, killed at lower temperatures. If milk therefore be raised to the temperature of boiling water, 212° Fahrenheit, and kept at that temperature for three minutes, it will be rendered free from the common disease-bearing germs. The milk will not have been boiled, as milk boils at a higher temperature than water, so there will be little alteration in taste. How far the process affects the vitamins is uncertain, but it is well to regard them as at a low level and to ensure their presence by the daily administration of cod-liver oil and orange juice. Apart from this, there is no evidence that the nutritional value of milk, subjected to this treatment, has been impaired.

For convenience and efficiency some form of the Soxhlet sterilizer is recommended. The apparatus consists essentially of a series of bottles, each to hold one feed for sterilization, a rack to hold them and a vessel in which the bottles are heated.

The advantages are that the milk mixture for half or the whole day can be prepared at one time, separated into feeds of appropriate size and sterilized at one time. On cooling, the bottles are automatically sealed. There is thus a considerable saving of time and the risk of contamination is reduced to a minimum.

For use, the food supply for half or the whole day is calculated, divided into the number of feeds, and each feed is put into a separate bottle. The water in the boiler is brought up to boiling point and kept there for three or four minutes. The bottles are then removed and cooled as quickly as possible and then stored on ice.

When a feed is required, it is warmed to 100°F., the rubber cap removed and replaced by a nipple.

THE FEEDING OF INFANTS ON DRIED OR CONDENSED MILK

The indications for the use of some form of preserved milk are broadly—

1. When the milk supply does not come up to the necessary high standard for infant feeding.

2. When the infant is placed on artificial feeding at a time when there is reason to expect that the necessity for further change will arise in the near future.

3. In times of epidemics.

4. Certain delicate infants, unable to digest fresh cow's milk, however modified, may be found to thrive on some form of milk powder.

In the matter of the potentialities of preserved milks the following extract from the well-known textbook *The Physiological Feeding of Infants and Children* by Dr. Eric Pritchard will be found reassuring:

'If a group of independent observers would take a series of infants and would feed them on dried milk modified to breast standard and would comply with all other physiological conditions, I am perfectly certain that they would come to the same general conclusion that I have come to after fifteen years' experience in the management of nearly 3,000 infants fed exclusively on dried milk, namely, that if this method does not give as good results as any other method, it is not the fault of the milk, but of the manner in which it is used'.

DRIED MILKS

The advantages of dried milks are:—

1. They are of known and uniform consistency.

2. They are easy to manage in the hot weather. If preferred, each meal may be prepared separately and there is no danger of it going sour.

3. The food is, as a rule, easily digested, more easily digested than fresh cow's milk, as the curd formed is much finer. Two preparations of pure milk, with a modicum of added carbohydrate, are commonly available in India. These are Sunshine Glaxo, and Cow and Gate. A study of the table reveals that the fat and carbohydrate content is approximately suitable to the Indian climate, but that the protein figure is that of cow's milk and therefore high for infant feeding in the early months. By using these foods, however, in the proportion of two measures to three ounces of water, we obtain a more suitable protein figure in a mixture of which the contents are as follows:—

Protein, 2 per cent; fat, 1.6 per cent; carbohydrate, 3.9 per cent.

It is therefore desirable, having made this dilution, to add carbohydrate in the form of milk sugar or dextri-maltose (e.g., Mellin's food) in the proportion of one heaped teaspoonful to five ounces. We may then give this mixture at the rate of 2½ ounces per pound body weight in the 24 hours. If the baby does not thrive or is constipated, we may add cautiously some form of cream (see below) as the fat content is somewhat low.

In using dried milks, we must not fail to consider the vitamin content. It is now held that, in dried milks, the vitamins A and B are present in sufficient quantities and that the vitamin C is absent. At the same time, making an exception of those foods to which vitamins have been specially added, it is well to safeguard against any shortage by adding a small quantity of cod-liver oil and fruit juice. In the hot weather, however, cod-liver oil is likely to give rise to indigestion and one of the concentrated preparations, such as Ostelin (vitamin D), Radiostoleum (vitamins A and D), or Adexolin (vitamins A and D), must be used.

Sometimes, in spite of the utmost care a regime such as the above does not suit the infant. In such cases, if there is evidence of protein indigestion, we may try Allenbury's No. 1 which is particularly suitable for delicate infants. Other infants flourish on acidified milk (see below).

It cannot be too strongly emphasized that the selection of a food should be based on a full knowledge of the contents and the requirements of the individual and that a change should not be made without reason and without plan in selecting the substitute. The trial of one food after another, with no knowledge of the contents and no appreciation of the requirements of the infant, is unfortunately a common practice.

Condensed milks are not to be recommended as a routine, the sweetened form contains a sugar content far in excess of requirements, and the unsweetened form has a high protein and low fat content. At the same time such milks have their value in times of trouble.

Suitably diluted, they may be found valuable in the case of a wasting baby, but the sugar content is excessively high; vitamins are deficient or absent, and prolonged use will lead to the development of rickets.

Ideal milk diluted 1 to 8 is half and half cow's milk and water. As the basis of a mixture it may be useful, as the fat appears to be more easily digested than that of dried milk.

The composition of the more commonly used prepared milk foods with low fat and carbohydrate, but high protein content, are given below :—

SUNSHINE GLAXO (diluted 1 to 8)—

Fat, 2.5; protein, 3.1; carbohydrate, 5.8.

Iron, 5 parts per 1,000,000.

Vitamin D, 130 I.U. per pint.

Caloric value, 135 per ounce of powder.

The average child in the hot weather will therefore require just over two measures of the powder for each pound of the body weight, in 24 hours. Fruit juice only need be added, but fruit juice should be taken.

COW AND GATE (diluted 1 to 8)—

Fat, 2.3; protein, 3.37; carbohydrate, 5.7.

Caloric value, 135 per ounce of powder.

Average requirements for child as for Sunshine Glaxo. Vitamins, e.g., Ostelin and orange juice, should be added to the diet.

Foods containing low protein and high carbohydrate. Suitable for delicate children and those suffering from protein indigestion as a temporary feed :—

Allenbury's—

No.	Albumin	Casein	Fat	Lactose	Dextri-maltose	Caloric value
1	0.7	1.0	3.1	7.3	3.25	134
	1.7			10.55		
2	0.7	1.15	2.9	6.7	3.8	134
	1.9			10.5		

Irradiated ergosterol should be added.

HORLICK'S MALTED MILK POWDER—

Protein, 13.8; fat, 9; carbohydrate, 70.8.

MELLIN'S FOOD—

Pure dextri-maltose.

A good cream supply is more difficult to obtain than a good milk supply, the fat value of the cream is inconstant and often unknown. Yet there are times when it is desirable to increase the fat content of the food, especially if we are using diluted milk.

A great deal of research has been devoted to the preparation of an artificial cream which will present not only all the essential characters of natural cream, but some advance in the matter of digestibility. Such creams are prepared from animal and vegetable oils reduced to a fine degree of emulsification, so that the fat is presented in the form of minute droplets easily attacked by the digestive juices. Some of these creams are designed not only to supplement the fat content but also to ensure against any deficiency in the milk or milk powder to which they are added. For this purpose, fresh butter from cow's milk, or cod-liver oil form a proportion of the ingredients, as both are rich in fat-solubles A and D. Such creams must not be expected to replace any deficiency of vitamin C, for which fresh fruit juice must be given. The advantages of such creams are manifest, and they may be used in conjunction either with fresh or dried milks.

One of the great difficulties of artificial feeding of infants is to keep the fat content at an adequately high level, as the infant is apt to be intolerant of fat from other sources in the same proportion as in breast milk. An artificial cream, with the type of fats well balanced and the fat globules finely divided, has been found in practice to be more easily digested than fresh cream. Further, it is of known and uniform strength, sterile and always available. Examples of such creams are New Zealand cream prepared after the formula of Sir Truby King, and Brestol. They must be used with caution in this country, but are valuable additions to the diet in the cold weather and, further, are well taken by children as a substitute for butter.

A further method of increasing to a small degree the fat content and making up any deficiency in vitamins, is to add to the bottle a cod-liver oil emulsion such as that of the Great Ormond Street Hospital, given below:—

R Cod-liver oil	..	..	η 30
Mucilage of acacia	..	..	η 5
Almond oil	..	..	η 1/16
Oil of cinnamon	..	..	η 1/40
Elixir of saccharin	..	..	η 5
Chloroform	..	..	η 1/16
Benzoic acid	..	..	grs. 1/16
Decoction of Irish Moss	to 1 drachm.		

One teaspoonful two or three times a day in the feed.

ADDITIONAL FACTORS

At least two teaspoonfuls of fruit juice daily should be added to all feeds, and lecithin and broth may be given, as for cow's milk feeding.

SPECIAL METHODS OF FEEDING

Predigestion of milk or milk mixtures.—Predigestion will be found of great value not only to delicate infants but also in the feeding of older children during the acute stage of illness. In order that the full benefit may be obtained, the ferments must be given ample time to act, the common method of allowing ten minutes or a quarter of an hour is of very slight value.

After a period of feeding on predigested food, it is desirable to allow the digestion of the patient to assume its functions gradually; for this purpose the time of predigestion should be shortened by stages.

Method.—Take one pint of milk or milk mixture prepared to the correct formula, bring quickly to the boil and cool down to about 117°F. Add two teaspoonfuls of liquor pancreaticus (Benger) or other suitable digestive powder. The temperature of the mixture is maintained at about 117°F. by placing the vessel in a container of water at 120°F. Stir occasionally.

The digestion is allowed to proceed for from one to three hours, at the end of which time the mixture is brought rapidly to the boil and cooled in the ice-chest.

Modification to suit the individual may be made by skimming the milk before digesting and adding lactic acid, 2 drops to each ounce, before administration. Sugar or dextri-maltose may be added to suit the case.

Fresh butter milk or skimmed milk.—This is a form of food to which frequent recourse will be had during the hot weather, when the full fat content of milk may cause digestive disturbance; it is also of value in fevers, when full-cream milk is distasteful and unsuitable and it is used for those infants who show evidence of weak fat digestion. It may be prepared on the same principle as top-milk, using the lower three-quarters instead of the

top quarter. The percentage composition is approximately:—

Protein, 3 per cent; sugar, 4.8 per cent; fat, 0.5 per cent; caloric value, 10 per ounce.

Butter milk (Glaxo).—A new preparation known as butter milk powder G. L. formula has proved of value in a number of cases showing high intolerance to fat. It may be used diluted one in ten when the formula is as follows, or somewhat stronger.

Reconstituted

	Per cent
Fat	0.55
Protein	3.35
Lactose	4.2
Ash	0.75
Lactic acid, citrates, etc.	0.15
Caloric value, 10.2 per ounce.	

Artificially acidified milk.—The physiological reasons on which this form of feeding is based are that the normal hydrochloric acid content of the gastric juice of infants is low, is easily abolished in illness or conditions of exhaustion, and that the mineral salt content of cow's milk is proportionately so high that the available acid is fixed and none is left for digestive purposes.

The consequence is that not only is the gastric digestion incomplete or inert, but that the stimulus to digestion power in the alimentary tract is wanting.

The writer has found this method invaluable in that state of exhaustion following a prolonged digestive disturbance, when it is difficult to stimulate the digestion to any signs of activity and also for those babies who may be termed difficult feeders, who are slow to develop to normal digestive capacity and refuse to thrive on any modification of cow's milk.

The acid added may be either organic or inorganic, lactic acid or hydrochloric.

Preparation.—The preparation of lactic acid milk is as follows:—

One pint of milk is boiled, cooled and the skin removed. To this is added 45 minims of lactic acid (British Pharmacopœia) drop by drop, stirring four times between each drop.

The milk must not be heated after the addition of the acid or it will curdle.

This method may be used also with milk prepared from a dry milk powder.

Dilute hydrochloric acid 2 to 4 minims to each feed may be used with advantage in conjunction with predigested milk.

Lacidac (Cow & Gate Co.) is a dried milk with the necessary quantity of acid already added. It is used in the same way as the ordinary dried milks and is easy to prepare.

CALORIMETRIC METHODS OF ESTIMATING THE FOOD REQUIREMENTS OF INFANTS

The caloric value of human milk is 20 per ounce and from the amounts of milk taken by average healthy babies that we are able to fix

the caloric requirements of infants. Thus a child of 10 pounds weight requires 35 to 50 calories to each pound of body weight and a child of 20 pounds 30 to 45 according to the climate.

This method of calculation is of great value in the feeding of those infants whose digestion demand a divergence from routine lines. For instance, a child shows signs of intolerance of fat, and the fat of the diet must be reduced. By the calorimetric method, it is easy to estimate the amount of reduction and replace the deficit by other food of equivalent caloric value. It is not wise to apply the method too closely in the case of delicate infants, but, at the same time, a careful count of the caloric value should be taken daily, so that should the child, of necessity, be underfed, the fact does not escape notice and early efforts may be made to bring the diet up to the required standard.

Example.—It is decided to feed a child, who is convalescent from a digestive disturbance, on milk and water half and half.

The child is 10 pounds in weight and should normally take 25 ounces in the course of the day.

Twenty-five ounces of the above mixture at 10 calories per ounce is 250 calories.

A child of 10 pounds weight requires 350 (i.e., 10×35) calories. The child is, therefore, though receiving the correct bulk of fluid, underfed. The fact is appreciated and as the digestion settles, efforts are made to make up the deficit. Each ounce of milk added to the mixture raises the value by 18 calories, the addition of one teaspoonful of sugar or malted starch by about 14.5 and one teaspoonful of medium cream by about 10.

Cautions and exceptions.—The chart should be used not only with reference to the weight, but also to the age of the baby. Infants below the average weight will require more proportionately even up to 70 to 75 calories per lb. Conversely, fat children above the average weight will require less per pound.

Calorific calculation is not admissible till the child is established on a diet. At the commencement of weaning or in the first few weeks of life, the child must be underfed in terms of calories. Similarly, when it is found, for any reason, necessary to change the type of feeding the full caloric requirements must be approached gradually.

After the ninth month, there is a period of gradual advance from the purely infant diet to that of childhood. This is not a matter merely of additions, but also of replacements. It will be necessary to make reductions in certain items of the diet, notably milk, butter may take the place of cream and bread of baked wheat or sugar. It is necessary to know the food value of each article added and the total caloric value of those to be replaced. The fruit juices which change can be satisfactorily

COW AND GATE reducing the food values of Fat, 2.3; protein, 2.0 denominator, in other Caloric value, 135 per ounce in terms of calories.

Table of caloric values, in calories per ounce, of common articles of diet in infancy and childhood (R. McCarrison)

Cow's milk	..	..	..	18
Human milk	..	..	..	18
Buffalo's milk	..	..	..	30
Whey	..	..	..	8
Cream	..	..	..	55
Butter milk	..	..	..	10
Skimmed milk	..	..	..	10
Cheese	..	..	..	111
Butter	..	..	..	208
Lean beef	..	..	..	43
Liver	..	..	..	43
White sugar	..	..	..	113
Brown sugar	..	..	..	108
Goor or jagger	..	..	..	100
Honey	..	..	..	81
Tapioca	..	..	..	100
Sago	..	..	..	97
White flour	..	..	..	102
Barley	..	..	..	100
Oatmeal	..	..	..	115
White bread	..	..	..	70
Brown bread	..	..	..	60
Suji or semolina	..	..	..	80
Biscuits	..	..	..	120
Egg, white	..	..	..	14
Egg, yolk	..	..	..	108
Soup	..	..	..	81
Jam, average	..	..	..	105
Prepared barley	..	..	..	103
<i>Special articles</i>				
Sunshine Glaxo	..	..	..	135
Cow and Gate (export)	..	..	..	135
Allenbury No. 1	..	..	..	134
Allenbury No. 2	..	..	..	134
Benger	..	..	..	107
Mellin's	..	..	..	81

WEANING AND DIET IN CHILDHOOD

General principles.—Every article legitimately considered as food may be said to consist of two parts, one which can be so altered by the digestive juices of the body as to become available for absorption into the body, and the other, known as the roughage, more or less untouched by digestion, but having its uses in stimulating the bowel and serving as a medium to carry away substances formed during the elaborate chemical processes of the body, which, if retained, would act as poisons. In the infant, some proportion of the fat in the food serves this purpose. The digestible portion of the food consists firstly of three main groups of chemical bodies, each group having different chemical formation and different function, though the functions are to a certain extent interchangeable. Each common article of diet contains one or more of these fundamental groups in varying proportions thus :

	Protein	Carbo- hydrate	Fat
Cow's milk	3.5	4.5	4
White bread	7.2	41.8	0.2
Egg, white	10.7	0.0	0.1
Egg, yolk	15.5	0.0	33.3

Each constituent is essential in due proportion and its deficiency cannot be made up by excess

of others, so that the rate of growth and progress is limited by deficiency in one constituent however plentiful the others may be. It is therefore important that the sum of the primary elements be in due proportion and amount to the needs of the body at any particular age and varied to some degree in accordance with occupation.

PROTEINS

Proteins available as food supply are widely distributed throughout edible materials. During the process of digestion proteins are split up into less complex bodies, the amino-acids, which are subsequently reconstructed in the tissues to form living proteins, and to carry out the main functions of growth and repair of tissues and elaboration of secretions. The food proteins are not all of the same structure; the amino-acids derived from them differ and are not all equally valuable in the reconstruction of a particular form of protein suitable to the individual. We therefore describe those proteins which afford the highest quality of suitable amino-acids as proteins of the first class. These proteins are mainly found in animal food and the source of supply in early life is from milk. The value of milk as an additional food factor during later childhood has been proved. Proteins may also be converted into energy, but this is an extravagant and undesirable process as poisonous waste products are formed which will throw an extra strain on the liver and kidneys. It is desirable that a protein balance be established (*see below*) the body taking in the full amount of protein required but no great excess. In the child the amount is two grammes per kilo body weight or approximately 30 grains to one pound, diminishing as age advances and the rate of growth abates.

Suitable proteins.—These are milk, curds, cheese, eggs, kidney, liver, meat, sweetbreads, fish, green leafy vegetables such as spinach, lettuce and young solo carrots, and whole wheat flour to some extent (McCarrison).

FATS

The deposit of fat in the body serves to keep the organs in place, to protect the more delicate structures from injury and as a heat regulator. Fats used in the body chemistry are a source of heat and energy and are necessary for the provision of certain more obscure chemical bodies essential to function. They are also an important item of the food as a source of vitamins. Fat storage in the body is most easily and directly obtained from fat in the food though it may be formed from other food constituents, particularly carbohydrate.

CARBOHYDRATES

This group includes sugars and starches of all kinds. A source of heat and energy, they are easily burnt up to simple innocuous bodies throwing no strain on the excretory organs. In order to render the combustion of fats complete,

the presence of carbohydrates in a proportion of at least 1.5 carbohydrates to 1 of fats is necessary.

The amount of carbohydrates in the food is usually adequate but if there is an excess of fat in the food the carbohydrates may prove insufficient for the complete combustion and the child is liable to develop acidosis. Further, children of a particular type, the nervous, highly strung and energetic type, are liable to utilize available carbohydrates quickly and the supply therefore must be large and given at frequent intervals lest symptoms of exhaustion supervene. The blood sugar of a child is subject to a considerable variation and the amount is rapidly reduced when the period of abstinence from food is prolonged. It is therefore advisable that the child should not go for more than four hours without food and that after any period of forced abstinence the first food taken should be of carbohydrates.

A well-balanced diet is an acceptable palatable diet, which, on analysis, is found to contain the different essential constituents in just such proportions as they are required by the individual.

A consideration of these functions will lead to the just deduction that, having regard to the varying activities of the human race, one standard of diet will not do for all, the infant is engaged in growing, at an enormous proportionate rate, while the adult, having ceased to grow, requires nutriment for repair and the production of energy, and so the balance cannot be the same.

It has been estimated that for the infant the correct balance of protein to non-protein is 1 to 7, altering slowly with advancing age till for the adult it is 1 to 6 or 5.5.

The fat proportion differs even more markedly.

	Fat	Carbohydrate
Infant ..	1	2
Second year ..	1	3.3
Adult ..	1	10

These proportions are frequently neglected, particularly in regard to the diet of young children, whose diet includes such a large proportion of cow's milk that the protein-non-protein ratio is often 1 to 3.

MINERAL SALTS

In addition to the prime principles, there are other constituents minute in quantities, but no less essential to health and growth. Mineral salts are required, not only for bone building, but they play an essential part in all the complicated chemical processes of the body in life. A deficiency of one or other may cause striking effects, a want of iron will cause anæmia, a deficiency of calcium may lead to convulsions, and a deficiency of iodine may bring in its train a series of severe symptoms.

In India, particularly in Bengal, or other countries on an alluvial soil, there is consider-

able difficulty in maintaining an adequate mineral supply owing to the poor mineral content of the vegetables which are the main source of supply. The vegetable broth is a convenient vehicle for maintaining the supply for young children. There is ample evidence that mineral deficiency, especially calcium and iron deficiency, is extremely common and it is therefore necessary periodically to supplement deficiency by the administration of these minerals in the form of tonics. The deficiency may be made up but the retention and utilization of the minerals can only take place where there is also an adequate supply of vitamins. The prevalence of nutritional anæmia in Bengal is due to the want of these accessory food factors.

List of foods affording good supply of mineral salts :—

Calcium (lime)—milk, butter milk, cheese, whey, yolk of egg, dāls, fruits of all kinds and green leaf vegetables.

Phosphorus—milk, butter milk, eggs, dāls, wheat, oats, barley, spinach, carrot, cauliflower, brussels sprouts, meat and fish.

Iron—liver, red meat, eggs, dāls, whole cereal grains, spinach, leeks, lettuce, onions, tomatoes (R. McCarrison).

VITAMINS

These bodies are known by the effect of their presence or absence. They may be considered as the spark that ignites the food fuel. Of late years, a substance considered identical with vitamin D has been produced by the action of ultra-violet rays on cod-liver and other ergosterol-containing oils, but beyond this we know them by their habitat, their virtues and the means by which they may be destroyed. One fact we are sure of, that these vitamins, intangible though they may be, are essential to health and we associate a definite train of symptoms with the absence or deficiency of one or other of the groups into which they are divided.

Medical men are familiar with diseases which develop in the absence or gross deficiency of one or the other of the vitamins, such diseases as rickets and scurvy, but, as Sir Robert McCarrison has pointed out, the deviations from health as a result of minor deficiencies are not fully appreciated and it is in infant and child feeding as a whole that we must guard against the minor deficiencies.

At present five main divisions are made, but of recent years there have been further subdivisions according to the properties ascribed to them as the result of experiments carried out with diets in which different fractions of the vitamins were absent or deficient. It is not necessary at this juncture to enter into a minute classification. It will be more appropriate to consider the properties and results of deficiency of vitamins under the main groups.

PROPERTIES OF VITAMINS

Fat-soluble vitamin A. Growth promoting, provides resistance to infection, deficiency produces xerophthalmia. Chief sources :—fresh milk, butter, cream, cod-liver and halibut liver oil.

Water-soluble vitamin B. Growth promoting. Complete absence will produce beriberi. If the supply is insufficient the results will be loss of appetite, indigestion and general irregularity in the function of the alimentary canal. There will be loss of weight, and general weakness with lack of vigour and a tendency to anæmia. Chief sources :—whole meal, whole grain, vegetables, yeast.

Water-soluble vitamin C. Anti-scorbutic. Chief sources :—fresh vegetables and fruits.

Fat-soluble vitamin D. Controls the phosphorus and calcium metabolism of the body. Prevents rickets and diseases associated with calcium deficiency. Chief sources :—articles containing vitamin A, and sunlight.

Vitamin E. The reproductive (of importance in later life).

Although these distinctions are made, there is ample evidence that the vitamins are to a certain extent interactive and that the general well-being of the child depends on an adequate supply of all varieties. These bodies, so essential to health, are unfortunately delicate. By prolonged cooking during the process of preservation of food and in tinned foods much of the vitamin value is lost.

It has been emphasized elsewhere that the vitamin content of the mother's diet must be adequate, if the baby is to be born healthy and if she is to feed it satisfactorily.

WATER

The human being can live for many days on water only, a fact which has not only been proved by the historic feats of professional fasters, but is a matter for daily observation when dealing with the sick. The converse does not hold good, and particularly in infancy, does the deprivation of water or excessive loss of fluid produce early menace to life. There is a constant exchange of water in the system, it is a component of all living tissues, it supplies the necessary fluidity of the blood and it dissolves and carries away waste products from the body.

The child, in proportion to its size, requires more water than the adult. The requirements of the average infant are calculated at 2½ ounces or more for each pound of weight. It is a cruel and hurtful thing to deny the free use of water to children. The error of taking too much is not likely to be committed. Some children, indeed, do acquire the habit of drinking water more frequently than is necessary and they require guidance. A child should be discouraged from taking large draughts at the beginning of

a meal though a draught taken an hour or half an hour before does no harm.

It is to be remembered that in hot dry climates, both through respiration and perspiration, the amount of fluid lost from the body is vastly increased and that this loss must be replaced.

In illness, particularly in diarrhoea, when the loss of water from the body reduces the available fluid to dangerously low levels, the first aim and the essential treatment is to replace this fluid by some means or other before the serious symptoms of water deprivation show themselves.

DIET AFTER THE APPEARANCE OF THE FIRST TEETH

Although it is customary to regard the age of nine months as that at which the diet of the infant should be changed, or rather, other forms of nourishment included in the dietary, it may be laid down as an axiom that the change should be made, not rigidly according to age, but according to the maturity of the system as indicated by the appearance of the teeth. In the case of a backward or delicate child we should naturally incline to delay and allow the child to have the benefit of the easily digested breast milk for some weeks longer. On the other hand, exceptionally vigorous and advanced infants may demand more concentrated food at an earlier age than is usual. Till the appearance of the first teeth, however, no change is made. Before this, the digestive functions have not matured sufficiently to deal with diet other than breast milk or its artificial equivalent. At the same time, though the appearance of the first teeth is the signal for advance, no change should be made during the actual eruption, a time when the digestive system is particularly sensitive to strain.

The secret of success in the transition to mixed diet lies in the gradual education of the digestive system and the consolidation of each step before a further advance is made. The commonest errors made are :—

(1) The first additions are made too suddenly. The bottle feeds are thickened to a degree incompatible with digestion.

(2) No provision is made for the development of the jaws by the supply of solid food, baked crusts or rusks. This should be the first addition as soon as there is any sign of the onset of dentition.

(3) The maintenance in the later stages of too large a quantity of milk in the diet, so that the child has no appetite for other forms of food and the balance is incorrect.

(4) The addition of more than one new article at a time, so that, in the event of disagreement, it is difficult to know the precise article on which blame should be laid.

(5) Insufficient attention to the vitamin content.

WEANING

The first step is the change from the breast to the bottle. Amongst European mothers, it is usual to accustom the baby to artificial feeding before proceeding to mixed feeding. This is not essential, but, in the interests of the mother, she may be considered to have done all that she safely can, if she has fed the baby till the arrival of the first teeth. Considerable practical difficulties in nursing arise when the teeth are in the process of eruption and the baby is biting hard at anything which is placed within the mouth.

The process of weaning should be gradual, one meal at a time being changed, the whole process being accomplished in from three to five weeks. For this reason, weaning may be commenced towards the end of the eighth month, so that the baby is ready to make further advances as the system demands. There is still the same necessity for maintaining the physiological balance, so the substitute may, with advantage, take the form of humanized milk, though at first the fat content should be kept at a definitely lower standard than that of breast milk. The balance is at this time gradually altering, with an increased demand for carbohydrate (farinaceous) food. At two years the proportion of carbohydrate to fat is 3.3 to 1 instead of 2 to 1 as in infancy. The proportion of protein in the diet is also very slightly raised.

During the process of weaning the child will, if fed on humanized milk, have become accustomed to some form of malted starch, so that the next step may be in the form of an unchanged carbohydrate; rusks, groats, baked flour or oatmeal jelly, such food being added in a tentative manner and the result observed. Of all these articles, the first to be added will be the rusk or baked crust, which will teach the child to chew, develop the jaws and assist in the cutting of the teeth. If, on the contrary, the baby has been accustomed to whole milk feeding, or some approximate dilution, the first step will be to add some intermediate food, such as Mellin's, to the diet and then proceed to the introduction of the unaltered farinaceous food.

MIXED DIET

Though considerable advances will be made within the next three months, milk will be the basis of the diet, and if the child has been fed on humanized milk mixture, the milk content in this will be gradually increased, while the added cream will be correspondingly diminished, till at the end of the year the child is taking pure cow's milk.

At the same time, with the addition of the farinaceous food to the bottle, the sugar will gradually be reduced.

The number of meals in the day is reduced by the gradual cutting down of the ten o'clock

feed, till ultimately the meals are four in the day with the addition of an early morning drink of fruit juice, sugar and water. This must, of course, be subject to circumstance; when the children take their airing in the early morning, something more substantial must be given. As to timing, in India, the time-table for the child is fixed according to atmospheric conditions and the most suitable hours for outdoor air and exercise.

The tenth month of life, therefore, is spent in weaning, the only addition being at first rusks, one given a quarter of an hour before two or three meals. Later, a small amount of baked flour, groats or oatmeal jelly may be added.

If vegetable broth has not been given at an earlier age, it should now be introduced, from four to five ounces being used as a substitute for water in one of the bottles.

The amount of milk or milk mixture at this age will be from thirty-eight to forty ounces in the day.

Age : 10 months, 11th month of life.

Additions : Groats or baked flour; milk pudding, made from rice or sago, starting with two teaspoonfuls; egg yolk on alternate days, starting with one teaspoonful; gravy and beef tea.

The total amount of milk, 30 to 35 oz.

Water will be necessary between meals.

Age : 11 months, 12th month of life.

Additions : Gravy and potato; egg or steamed custard; bread and butter.

Total amount of milk, 25 to 30 oz.

The diet from the 13th to the 18th month :—

Early morning: Orange juice, sugar and water.

Breakfast: Toast and butter, one slice; barley jelly or strained oatmeal; milk, 8 oz.

Lunch: Gravy and potatoes or boiled egg and breadcrumbs; milk pudding; bread, one small slice or rusk or toast; vegetable soup; milk, 4 oz. in pudding, or stewed fruit.

Tea: Milk, 8 oz., rusk; bread and butter; sponge cake.

Cocoatina may be added to the milk.

The milk may now be given pure or, in the hot weather, with one-quarter of its bulk in water added.

After the fifteenth month, steamed fish or brains or pounded chicken beginning with one tablespoonful may be added.

Age : 18 months to 2 years.

Early morning: Fruit juice with sugar and water.

Breakfast: Groats or strained oatmeal with milk, treacle or sugar; milk, 8 oz.

Lunch: Fish or pounded chicken or brain, or chicken pish-pash; once or twice a week, liver and spinach soup; stewed green vegetables, young carrots or vegetable soup; milk pudding or stewed fruit or junket; water to drink.

Tea: Rusks, biscuits, sponge cake; honey or fruit jelly; milk, 8 oz.

Supper: Cup of milk with biscuit of Horlick's malted milk.

Note.—Total milk, including that used in cooking, 1 to 1½ pints. A boiled cutlet or other suitable bone should be given daily for a few minutes for the child to gnaw.

Age : 2 to 5 years.

Early morning: Orange juice or grapefruit juice or tomato juice with sugar to taste.

Breakfast: Porridge or groats with milk, sugar or treacle; eggs three days a week; bread and butter or crisp toast with honey or fruit jelly; milk, 8 oz.

Lunch: Fish or meat (mutton, beef or chicken); potato, baked, mashed or boiled; mashed vegetables (cauliflower, carrots or greens); milk pudding with stewed fruits, junket or custard; water to drink.

Tea: Toast and butter; sponge cake; honey or fruit jelly or stewed fruit and custard or junket; milk 6 to 8 oz.

Supper: Cup of milk or Horlick's malted milk.

Note.—Total amount of milk 16 to 20 oz.

The following vegetables are suitable for young children:—Peas, vegetable marrow, boiled cucumber, Jerusalem artichokes, cauliflower, young cabbage or carrots well mashed, onions. Before 18 months, they are best given in the form of strained vegetable broth.

GENERAL PRINCIPLES

The advance to mixed feeding is one of education, each step must be taken cautiously with due observation of the results. It must be borne in mind that if the child is upset by the too rapid addition of new forms of food, his progress may be delayed for months.

Above all, the child must be instructed in that most important preliminary to digestion, the proper mastication of food. Without this, the teeth cannot be properly cut, the jaw will not develop, and the shape of the face will remain immature. Further, there will not be due expansion of the nasal airway, so that any tendency to adenoids may be perpetuated.

Rest after a meal, for a short time, is always desirable, as all the nervous force is required for digestion.

Salt should be added in moderation to all meals, but children should not be allowed to partake immoderately, as many will if permitted.

Eating between meals must never be permitted though water may be allowed and should always be available.

Sugar is perfectly harmless in moderation, but in excess it causes acidity and fermentation, and perverts the appetite. A moderate amount of ripe fruit may always be given with safety to a child over two years of age, but nuts, bananas, dried or preserved fruits (except when

(Continued at foot of opposite page).

THE DISTRIBUTION OF INDIAN TICK TYPHUS WITH NOTES ON LABORATORY FINDINGS

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INTRODUCTION

PREVIOUS to the world war which commenced in 1914, there was very little knowledge of the typhus-like fevers—apart from the classical louse-borne epidemic disease—except in the case of Rocky-Mountain spotted fever. The numerous and extensive outbreaks of typhus during the war in various countries, both of the West and the East, led to intensive study of this disease and its vector the louse. This study led, not unnaturally, to the recognition of other clinical entities, resembling the classical typhus in some of its manifestations, but obviously existing under conditions which precluded the usual rôle of the louse as a vector. Such typhus-like diseases have been described from every continent and are evidently of world-wide distribution.

Since they differ in their clinical manifestations from one another and from classical typhus only slightly, or in degree of severity, it is natural that they should be grouped together as the 'typhus group' of diseases. On their further classification, however, there is considerable difference of opinion and various systems have been advocated. That there should be some attempt at classification is important, since, while treatment may vary little, attempts at prevention or eradication are obviously closely bound up with the method of spread of each type and this, again, is entirely dependent on the arthropod vector. These considerations fully justify Megaw and Rao's (1928) criticism of Goodall's (1927) suggestion that these diseases are all 'typhus fevers pure and simple'

(Continued from previous page)

stewed) should never be allowed. Tea should not be allowed before the age of five, though the merest drop in the milk can do no harm and will please the child. Alcoholic liquors in any form, except when prescribed as a medicine, should never pass the child's lips.

Among other articles to be avoided may be mentioned: Jams with pips or seeds, coarse oatmeal and fruit having hard fibres, such as pineapple.

Most children dislike fat and it should not be forced on them as the necessary content of the food is already provided.

Chocolates and sweets in moderation may be allowed immediately after meals, but they should not be given between meals.

and that there is no need for further differentiation. The world-wide prevalence of typhus-like fevers, apart from certain proved findings, make it certain that the same vector, or even type of vector, is not responsible for the transmission of all members of the group and that, therefore, from the point of view of prevention or prophylaxis some classification is necessary. This is so obvious that the point need not be further stressed. While admitting, therefore, the necessity for some classification, it is not easy to decide on the most satisfactory basis for this classification, since the data for any particular system are as yet inadequate. This subject will be reverted to in a subsequent section.

As regards the typhus-like fevers in India, the first to call attention to these was Megaw (1917) who described an attack of fever from which he himself suffered and where there was a strong presumption that a tick was the vector. He also drew attention to the close similarity between his case and the fever investigated by McKechnie in the Kumaon Hills, the same area in which Megaw himself had been infected, and concluded that they were the same disease or, at least, diseases belonging clinically to the same typhus group. Since then many cases of the same disease have been reported from various parts of India and it is with a view to bringing before the medical profession in India the distribution of these cases that the present account has been written. It is hoped thereby that the recognition of the disease and the search for the vector or vectors may be stimulated since the vector may be different in different parts of and at different elevations in the sub-continent of India.

DISTRIBUTION OF CASES

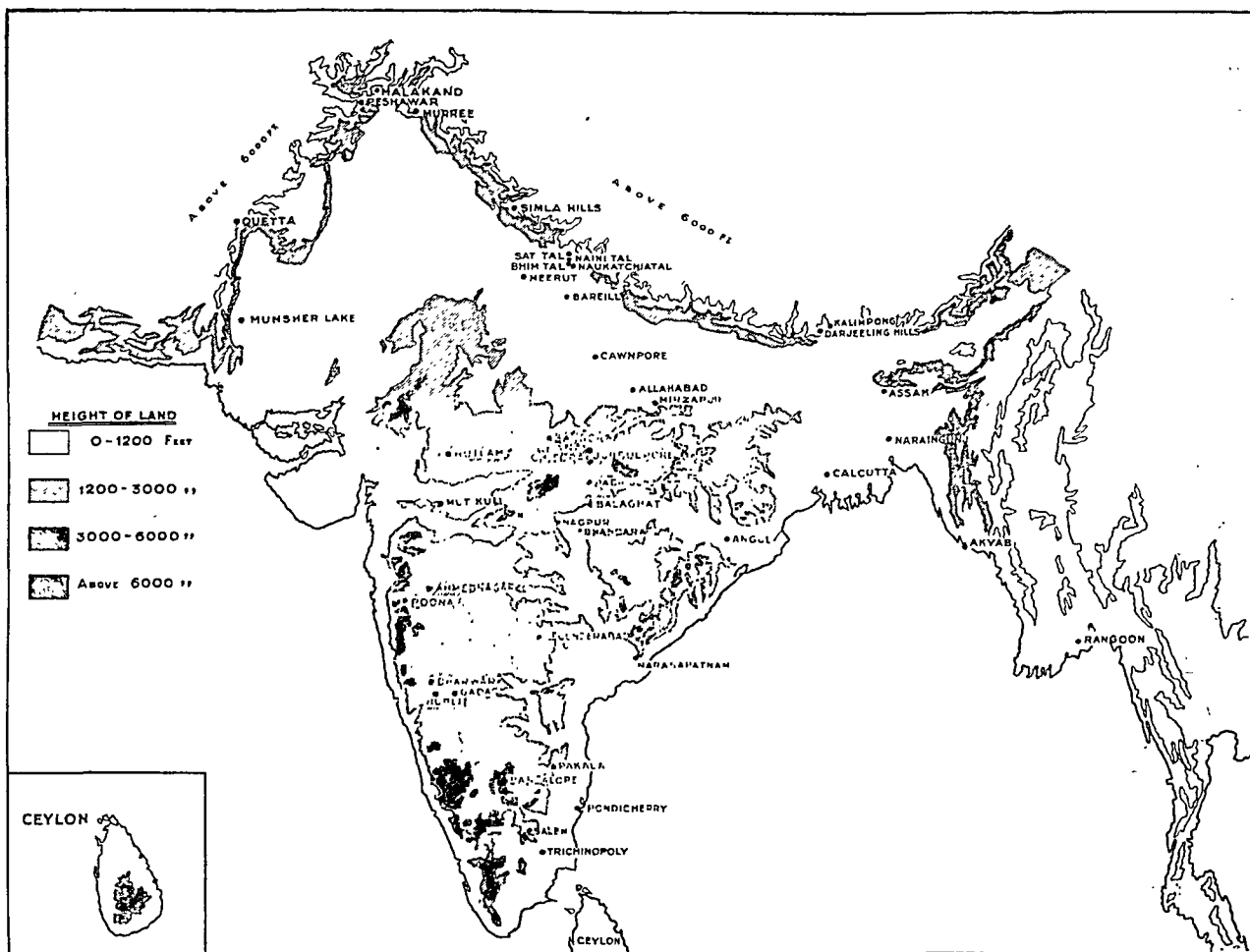
The distribution of cases can be shown most conveniently by a combination of a list of localities of recorded cases with a sketch map showing the approximate elevation of these places (see sketch map). The factors of locality and elevation must be considered together since climate, which must affect the vector or vectors, is largely affected by these two factors. Thus the cold weather in the plains is roughly equivalent to the summer in the hills, and it is, therefore, interesting and instructive to note that there is a general tendency for cases of the typhus group of fevers to occur in the summer time in the elevated parts of the country (4,500 to 6,000 feet) and in the winter season in the plains. Any search for a vector or vectors would have, therefore, to take into consideration factors such as these climatic requirements. The recorded cases of typhus-like fevers in India are summarized below according to localities, together with certain other details.

From table I it will be seen that there are 177 recorded cases of fever corresponding to the type we have called typhus-like fevers. Among

these there is a definite history of tick bite in 16 cases. It will also be seen that the distribution of the cases is India-wide. A third observation, which is equally evident, is that the cases occur throughout the year but this observation, on analysis, has to be modified. It will be seen that the cases may be classified into those occurring in the summer months and those occurring in the winter months. These two classes correspond very exactly with places which have a moderate climate (so far as temperature goes) at these two periods. In general terms elevated situations with relatively cool

has been given by Macnamara (1935). As regards the Weil-Felix reaction this was positive for *B. proteus* OXK suspensions in all the cases (16) except two, one fatal case of doubtful diagnosis and one case which gave a reaction with proteus X19 to a titre of 1:5,000. The latter case has not been published. The titre in the cases positive to OXK suspensions varied from 1:150 to 1:25,000. Unfortunately we were only able to study the last four cases, two of which were already in the later stages of their attack. From these cases blood was obtained and inoculated into a series of animals.

MAP



summer climates show cases in the summer months while plains areas with relatively cool winter climates show cases in the winter months.

TICK TYPHUS IN THE SIMLA HILLS

For some years it has been usual during each rainy season for a number of cases of tick typhus to be admitted to the British Military Hospital in Kasauli. During 1933, there were about a dozen cases. In 1934 there were more than this number, admitted both from Kasauli itself and the neighbouring hill stations Subathu and Dagshai. A clinical account of these cases

ANIMAL EXPERIMENTS

About 120 animals in all were used in these experiments including guinea-pigs, white rats, rabbits, mice and a squirrel, but, as the animal inoculations gave somewhat inconclusive results, we consider it unnecessary to describe them in full detail and only the salient points will be considered. It should first of all be noted that the regular passage of the infection from animal to animal in series, with presence of rickettsia, as noted in some of the typhus group of diseases in other parts of the world, was not seen.

It is notoriously difficult to be certain as to whether apparent departures from the so-called

TABLE I

Showing the locality of recorded cases of typhus-like fever in India with other details

Locality where typhus-group fever was contracted	Number of cases	Time of year	If any history of possible vector	Approximate elevation in feet	Authority
Sat Tal ..	1	July	History of tick bite 20 days before.	4,400	Megaw.
Bhim Tal and Sat Tal (probable cases).	13	May to October	No history	4,500	Megaw (after Mc-Kechnie).
Sat Tal (probable cases).	15	Not known	"	4,400	"
Bhim Tal (probable cases).	4	May to October	"	4,500	"
Nagpur ..	3	Not known	"	1,025	Megaw (after Chapman).
Cawnpore ..	1	November	"	500	Megaw (after Hardy).
Bangalore ..	2	Not known	History of tick bite in one case.	3,000	Megaw (after Sprawson).
Murree ..	1	June	No history	7,507	Keates.
Bhim Tal ..	1	Not known	History of tick bite	4,500	Megaw (after local doctor).
Hubli ..	1	"	No history	2,500	Jackson.
Dharwar ..	2	"	"	2,580	"
Gadag ..	1	"	"	300 to 400	"
Pakala ..	1	"	"	1,260	"
Narasapatnam (Agency tracts).	9	February	"	262	Cunningham and Theodore.
Saugor (C. P.) ..	11	"	"	1,940	Megaw, Shettle and Roy.
Angul (Orissa) ..	2	January and February.	Probably bitten by ticks. (Marks on sites.)	1,200	Megaw.
Naraingunj (Dacca)	1	January	Bitten by tick 7 days before.	Plains (not over 10 feet).	"
Akyab (Burma) ..	1	Not known	Tick found on body 10 to 14 days before but not biting.	20	"
Saugor ..	1	February	No history	1,940	"
Balaghat (C. P.) ..	2	January	Tick bites 8 days and 2 days before.	1,000	"
Naini Tal ..	1	August	No history	6,409	Banerjee (really Mc-Watters).
Naukatchiatl (Naini Tal 15 miles).	1	September	"	4,240	"
Allahabad ..	1	March	"	309	Banerjee.
Rutlam (C. P.) ..	1	October	"	1,800	Megaw and Rao (after Scott).
Secunderabad ..	1	November	Bite by some insect 6 days before.	1,830	Megaw and Rao (after Fielding).
Trichinopoly ..	1	January	No history	268	Megaw and Rao (after Norman and Ramchandran).
Bangalore ..	1	November	Bitten by ticks 14 days before.	3,000	Megaw and Rao (after McPherson).
Malakand ..	1	Not known	Bitten by ticks	3,000	"
Mut-Kutli (C. P.) ..	1	January	No history	3,500	Megaw and Rao (after Hamilton).
Dhana (near Saugor)	1	"	Lice on body	1,290	Megaw and Rao (after Dotivala).
" " "	1	"	"	1,290	Megaw and Rao (after Shettle).
" " "	1	"	No history	1,290	Megaw and Rao (after Roy and Rao).
Near Saugor ..	1	December	"	1,940	"
Chitora (near Saugor)	1	January	"	1,860	Megaw and Rao (after Rao).
Kalimpong ..	1	June	Bitten by tick 5 days before.	3,933	Megaw and Rao (after Walker).
Padrigunj (C. P.) ..	1	January	Bitten by two ticks	2,000	Megaw and Rao (after Doyle).
Allahabad ..	1	September	Bitten by insect 10 days before.	309	Megaw and Rao (after Ghosh).

TABLE I—concl'd.

Locality where typhus-group fever was contracted	Number of cases	Time of year	If any history of possible vector	Approximate elevation in feet	Authority
Mirzapur ..	1	March	Bitten by insect a few days before.	282	Ghose.
Allahabad ..	1	"	Bitten by insect a week before.	309	"
Poona ..	2	September	No history	1,850	Pai.
" ..	1	January	"	1,850	"
" ..	5	Not known, original not available.	"	1,850	Lindberg.
Nagpur ..	3	October to November.	Tick bite 17 days before in one case.	1,025	Mukerji.
Bhandara (C. P.) ..	1	November	No history	1,696	"
Rangoon ..	1	January	"	41	Kundu.
Bangalore district ..	3	October to January.	"	3,000	Biggam.
Meerut ..	1	February	Tick bite about 10 days before.	735	Christian.
Pondicherry ..	1	September	No history	6	Labernadie.
Munsher Lake (Hyderabad, Sind).	1	April	"	..	Lindeman.
Quetta ..	1	September	"	5,502	"
Jubbulpore ..	5	Aug. (2 cases) Jany. (1 case) March (1 case) Nov. (1 case)	One " case bitten by ticks.	1,500	Sachs.
Barcilly ..	1	September	Bitten by ticks 5 days before.	500	"
Peshawar ..	1	January	No history	1,110	"
Simla Hills ..	35	August to October.	"	4,000 to 6,000	Macnamara 34; 1 unpublished case.
Salem (Madras) ..	1	?	"	900	Personal not published.
Darjeeling Hills ..	1	September	"	4,500	"
Assam ..	1	?	"	200	"
Ahmednagar ..	13	August to January.	Tick bite in two cases	..	Blewitt.
Calcutta ..	1	November	"	18	Wilson.
Bareilly ..	6	? November till early in May.	"	500	Christian.

normal temperatures in animals are really indications of an infective process, and therefore the temperature charts are not particularly informative. Under the circumstances it is unnecessary to give them in detail and only a few are produced to illustrate special points.

Guinea-pigs.—If the guinea-pig's normal temperature be taken as between 101°F. and 102°F., 26 out of a total of 28 guinea-pigs showed no marked fluctuations above or below this level, although the minimum and maximum levels represented a difference of at least five degrees. Two guinea-pigs, however, both inoculated intraperitoneally with blood from the same case, suffered from what appeared to be a definite febrile attack, commencing about 14 days after inoculation. The normal temperature of these guinea-pigs was between 100°F. and 101°F. by the thermometer in use. The charts (I and II) are given below. It will be seen that one of the animals had a preliminary rise on the 9th day. Neither of the animals suffered from any enlargement or evident inflammation of the testicular region, but, unfortunately, no further

investigation of these animals was carried out at the time.

Rats.—These animals, on the whole, appeared to give the best evidence of a definite infective process after inoculation, but this was limited to the primary inoculation of patients' blood and subpassage gave very indefinite results. Out of 8 primary intraperitoneal inoculations of blood into rats from four human cases 6 rats showed a definite febrile reaction after incubation periods of 9, 9, 6, 7, 12 and 7 days, respectively. Three typical charts (III, IV and V) are given below.

It will be seen that the temperatures during the febrile period are in the nature of more marked oscillations than those normally found rather than a prolonged higher temperature.

Rabbits.—Three rabbits only were inoculated from two human cases. Two showed no reaction but one showed a febrile reaction commencing eight days after inoculation and lasting for six days. The temperature chart is given below.

Mice.—Temperature records of the mice were not maintained.

(c) Congestion with œdema, sometimes marked, of the tunica vaginalis.

CHART I
Guinea-pig

CHART II
Guinea-pig

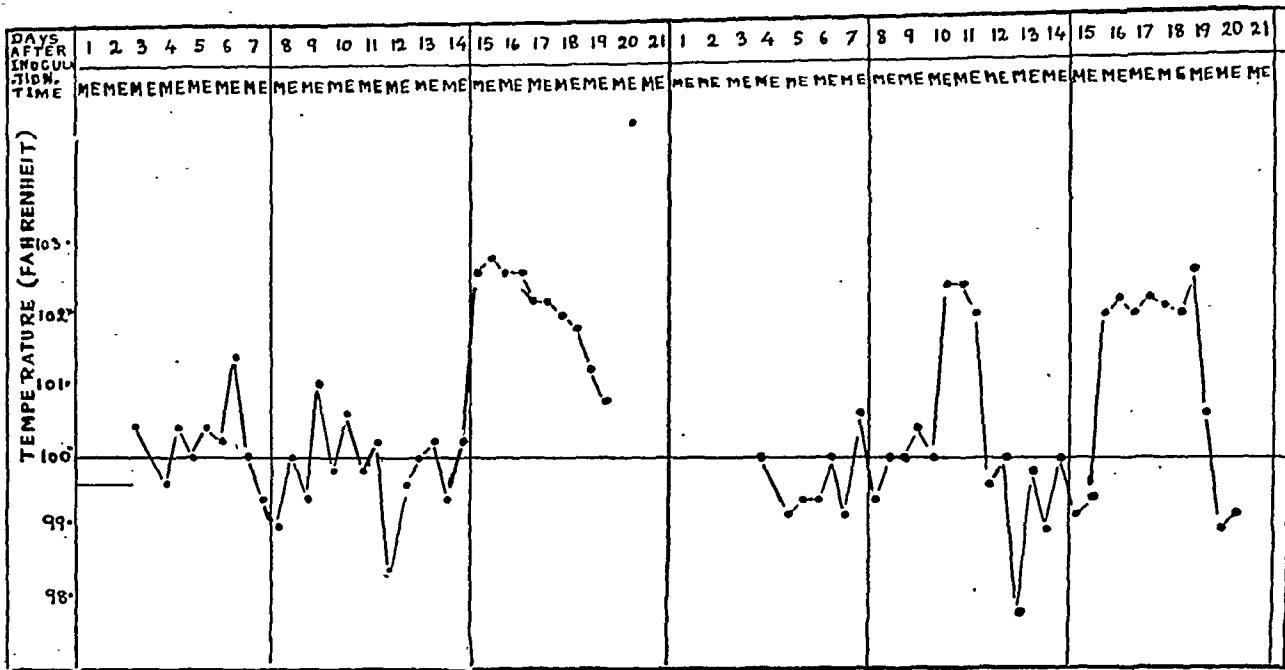
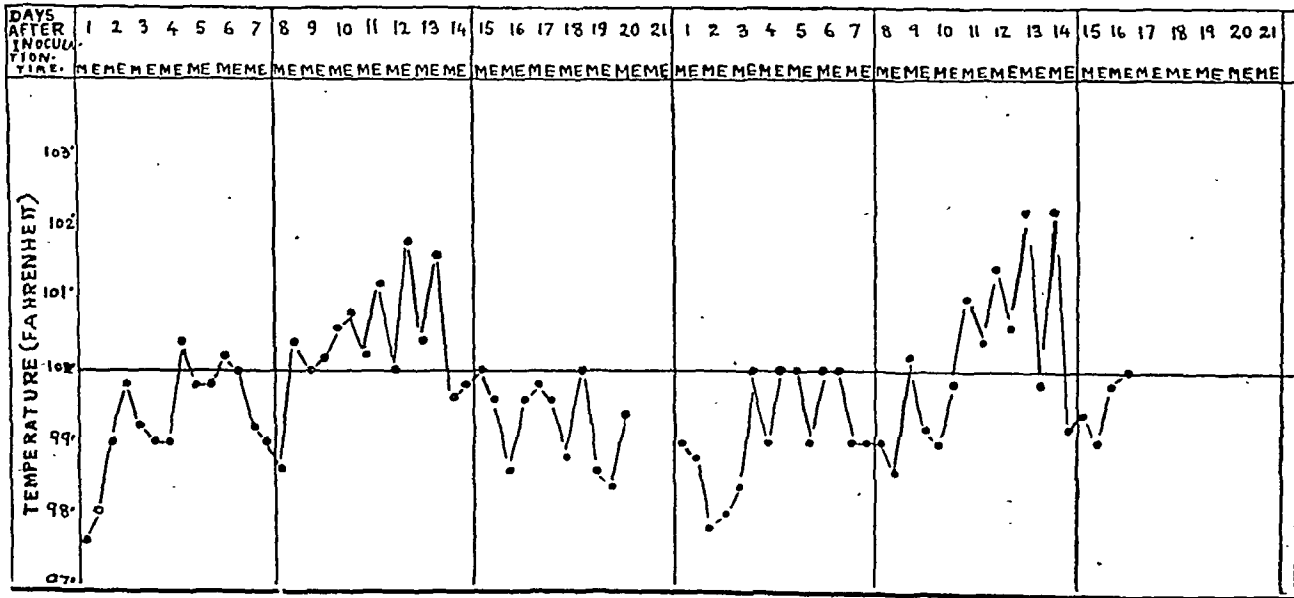


CHART III
Rat

CHART IV
Rat



PATHOLOGICAL AND SEROLOGICAL FINDINGS
IN ANIMALS

Guinea-pigs.—(1) The pathological changes in inoculated animals were inconstant but a few showed the following changes:—

- (a) Enlargement and congestion of the spleen.
- (b) Marked congestion of the suprarenal capsules.

(d) The presence of organisms morphologically resembling *rickettsia* in smears from the tunica vaginalis.

(2) The sera of thirteen of the experimental guinea-pigs were each tested twice at various times after inoculation for agglutination against proteus OXK, OX19 and OX2 emulsions but in only one case was there any serological response shown. This guinea-pig showed

CHART V

Rat

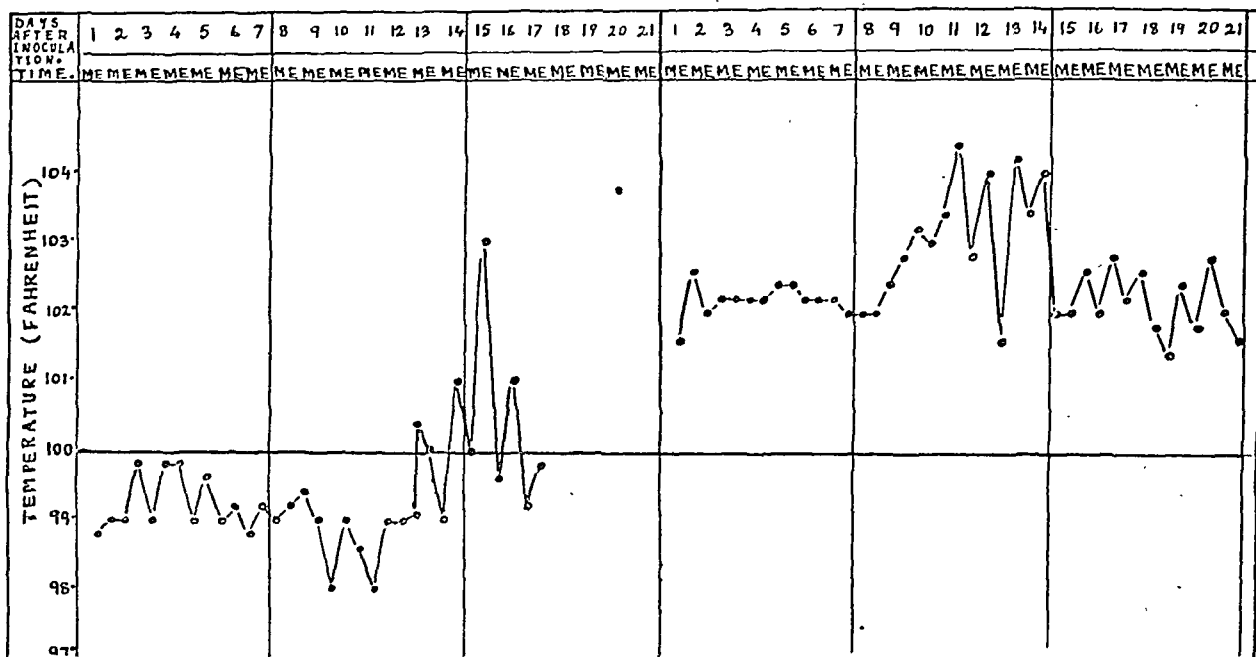
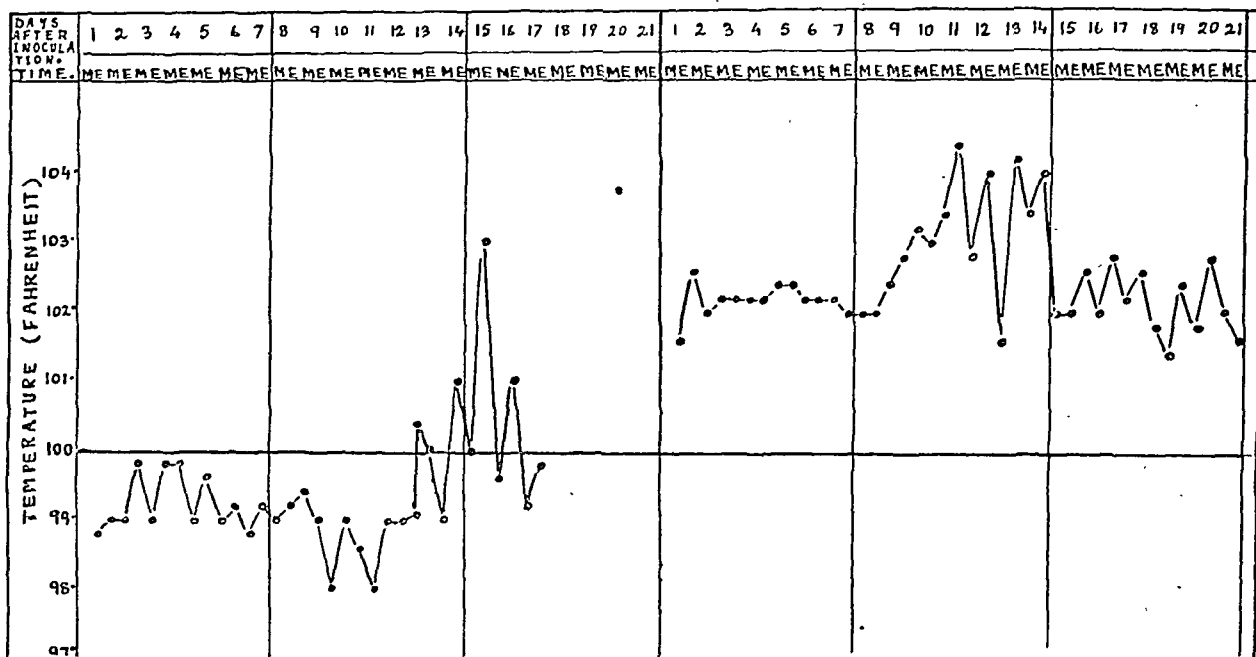


CHART VI

Rabbit



agglutination with OXK in a dilution of its serum of 1 in 50. The remainder showed either no response or agglutinated OXK in a titre of 1 in 25, a result commonly obtained with normal guinea-pigs.

Rats.—(1) The infected rats showed the following pathological changes:—

(a) Enlargement and congestion of the spleen.
(b) Marked congestion of the suprarenal capsules.

(c) Congestion and oedema of the tunica vaginalis with, in one case, a testicular abscess, containing a mixed bacterial infection.

(d) The presence of organisms morphologically resembling *rickettsia* in smears of the tunica vaginalis.

(2) The sera of eight of the infected rats were tested for agglutination against proteus OXK, OX19 and OX2. The results of these tests are given in table II.

TABLE II

Showing the serological results of the rat experiments (OX2 was negative throughout)

Rat	OXK	OX19
1	50 trace	125
2	..	..
3	25 trace	50
4	25	..
5	25	25
6	25	50
7	25	25
8	25	..

Rabbits.—(1) The three rabbits experimented with showed no signs of illness, apart from a

febrile reaction in one, and were not examined for pathological changes.

(2) One rabbit out of the three used gave a distinct agglutination response to emulsions of OXK with a rapid rise in titre in the course of six days. This, however, was not the rabbit which showed a febrile response. The results given by the rabbits are shown in table III.

TABLE III

Showing the serological results of the rabbit experiments

Rabbit	OXK	OX19	OX2	REMARKS
1	..	..	..	..
2	..	25 trace	..	..
3	125	25	25	19 days after inoculation.
	250	25	25	25 days after inoculation.
	500 trace	25	25	27 days after inoculation.
	500 trace	25	25	30 days after inoculation.

SEROLOGICAL INVESTIGATIONS

The sera of certain laboratory animals and of wild rodents were examined. The latter gave results of some interest.

We had frequently heard old residents of Kasauli remark on the fact that the grey palm squirrel (*Sciurus palmaris*) was a new addition

to the fauna of Kasauli. They were said not to have existed there until a few years ago when they were introduced for experimental work at the Pasteur Institute of India, Kasauli. That this is probably correct is also shown by the fact that they have gradually extended their range in Kasauli in a north-to-south direction from the Pasteur Institute, which occupies the extreme north point of the cantonment. Now, as it was stated that the cases of tick typhus were also a new phenomenon, it occurred to us to consider any possible changes in the local fauna, and the question of grey squirrels immediately suggested itself to us.

We therefore trapped a considerable number of these squirrels from the Pasteur Institute estate, where one case of tick fever had just occurred and examined these from the serological point of view. Their sera were put up against O suspensions of proteus XK, X19 and X2—alcoholized, standardized suspensions were used and Dreyer's technique—4 hours in a water bath at 52°C. and incubation at 37°C. overnight.

In all but five instances the results were entirely negative with proteus OX19 and OX2. The results of these five exceptions are given below :—

Serial number	OXK	OX19	OX2
14	50	..	25
22	25	..	25
40	125	25	..
48	50	25	..
64	25	25	..

However, with OXK, 36 out of 65 were positive in dilutions of 1 in 25 or more, 3 being positive in a dilution of 1 in 125 and 16 in a dilution of 1 in 50. These results are especially interesting in view of the fact that all the local cases of tick typhus, with one exception, had shown reactions to the same strain, proteus OXK.

To control these results we next obtained approximately the same number of squirrels from plains areas (Ambala and Saharanpur) and tested the sera of these against the same strains. The results are in striking contrast to those obtained with the Kasauli squirrels. In the case of the plains squirrels only 12 out of 62 showed any agglutination against the OXK strain, two showed agglutination against OX19 and none against OX2. The two showing agglutination against OX19 are shown below :—

Serial number	OXK	OX19	OX2
58	25	25	..
61	250	125	..

The results of the agglutination with OXK in the two series are shown in the table below :—

TABLE IV

Results of agglutination tests with serum of squirrels from two sources, against an O suspension of proteus XK.

Titre	Number of Kasauli squirrels showing this titre	Number of plains squirrels showing this titre
Negative ..	29	50
1 in 25 trace ..	3	4
1 in 25 ..	14	4
1 in 50 trace ..	6	1
1 in 50 ..	10	2
1 in 125 ..	3	..
1 in 250 ..	..	1
TOTAL ..	65	62

The significance of the great contrast in these two batches of squirrels is not evident, but, since the agglutination was given only against the same organism which gave positive tests in the human cases, the fact is worthy of notice for further investigation, especially inasmuch as the entomological findings, to be later mentioned, showed a similar marked contrast in the two sets of squirrels. Besides the squirrels other rodents, as well as a few dogs, were examined serologically and the results are given without comment in tables V, VI and VII

TABLE V

Showing the results of agglutination tests with various laboratory animals

Animal	Number	STRAINS		
		OXK	OX19	OX2
Rabbit ..	1	25	Negative	25
" ..	2	25		25
" ..	3	25		50
" ..	4	Negative		Negative
" ..	5	25		25
" ..	6	25	"	25
Guinea-pig	1	25	"	Negative
" ..	2	50	"	"
" ..	3	50 trace	"	"
" ..	4	25 trace	"	"
" ..	5	50 trace	"	"
" ..	6	25 trace	"	"
Rat ..	1	"	"	"
" ..	2	"	"	"
" ..	3	50	"	"
" ..	4	50	"	"
" ..	5	Negative	"	"
" ..	6	50	"	"
Dog ..	1 (Sam-son).	25	"	25
" ..	2 (Sam)	50 to 125 trace.	25	50

When experiments were performed with this sterile venom solution and under strictly aseptic conditions, it was found that no hæmolysis took place even in the case of the cobra venom which is so strongly hæmolytic. Passing the venom solutions through the Seitz filter has, therefore, the effect of eliminating the hæmolysing fraction completely from the venom. The details of the experiments are set forth in the table.

From the table it appears that cobra venom has lost the power of hæmolysis altogether by being passed through the Seitz filter. The same experiments were repeated with red blood corpuscles obtained from guinea-pigs with almost identical results. Unfiltered cobra venom solutions in concentrations of 1 in 20,000 and 1 in 40,000, however, completely hæmolysed red blood corpuscles obtained from guinea-pigs within 10 minutes, whereas with human red blood corpuscles only a partial hæmolysis took place under those conditions, showing that the former are more susceptible to hæmolysis by cobra venom than the latter.

The next point to ascertain was whether the hæmolytic element was altogether eliminated by being passed through a Seitz filter or was merely inactivated by this process. It is a well-known fact that both cobra and Russell's viper venom which would not ordinarily hæmolysed red blood corpuscles obtained from sheep would do so in the presence of a very small amount of lecithin. The experiments in group (3) of the table will show that lecithin had no effect whatsoever on the filtered venom solutions with respect to hæmolysis.

The same experiments, when repeated with venom solutions that were not passed through the Seitz filter, gave the usual results. Both cobra and Russell's viper venom hæmolysed sheep's red blood corpuscles very readily in the presence of lecithin, as will be seen from group (3) of the table.

Experiments were also made to test whether the venom solutions had undergone any change with respect to their proteolytic activity by this process of filtration. It was found that with respect to the properties of dissolving fibrin, the liquefaction of gelatine and also the clotting of milk (rennetic activity) these venoms retain their activity almost unimpaired after filtration through a Seitz filter. Analysis was also made with respect to the protein constituents of the filtered and unfiltered venom solutions but no marked difference could be observed between them.

Pharmacological action.—In order to see whether, corresponding to the loss of hæmolytic property, the filter-passed venom solutions have suffered any change in their pharmacological characteristics, a female cat weighing 1,517 grammes was anæsthetized with urethane and given successively four doses of 0.5 c.cm. of 0.1 per cent venom solution in normal saline, as shown in the table below.

Venom solution	Blood pressure	Respiration
1. Cobra (unfiltered).	Small but maintained rise.	Transitory dilatation of bronchi followed by sudden return to normal and very slight increase in amplitude and rate.
2. Do. (Seitz filtered).	No effect.	Slight increase in rate.
3. Russell's viper (unfiltered).	Marked and permanent fall.	Sudden increase in amplitude and rate showing constriction of the bronchi and stimulation of the centre followed by respiratory irregularity and spasmodic breathing.
4. Do. (Seitz filtered).	Slight maintained rise.	No effect.

With respect to the cobra venom the vascular effect is altogether absent in the filtered solution but no such marked change was observed as regards the respiratory effect. With the Russell's viper venom, however, we find that there is a marked change with respect to both these actions.

Discussion.—The results mentioned above suggest that by the process of filtration through Seitz filters either the hæmolytic element has been altogether eliminated or it has been inactivated in such a manner that it is incapable of being reactivated by lecithin. The former hypothesis appears to us to be the more probable one, as Houssay (1921) found that the hæmolytic substance of snake venom is absorbed by animal charcoal, the residual venom solution being non-hæmolytic. We believe that with the Seitz filter also a similar process of adsorption is responsible for the loss of hæmolytic property.

Experiments are in progress with a view to ascertaining the nature of this hæmolytic principle and also how far this process of filtration through Seitz filters affects the other properties of the venom solutions.

SUMMARY

1. Passing of the venom solutions (cobra and Russell's viper) through the Seitz filter renders them non-hæmolytic.
2. The Seitz-filtrate of venom solutions are not reactivated by lecithin.
3. In the filtrate from cobra venom solutions the vascular effect is altogether absent, the respiratory effect being only slightly affected, whereas in the case of Russell's viper venom filtration through a Seitz filter has a marked effect on both these properties.

REFERENCE

Houssay, B. A. (1921). *Rev. Inst. Bact.*, Vol. II, p. 197.

TABLE

[illegible]

++++ Complete hemolysis.

Complete.
Doubtful.

H	+	Double.
I	+	No hemolysis.

+? .. Complete hemolysis of r.b.c. but the supernatant fluid clear.

TABLE

HÆMOLYSIS.									
VENOM SOLUTIONS PASSED THROUGH SEITZ FILTER.				UNFILTERED VENOM SOLUTIONS.					
Serial no.	R.b.c. suspension	Venom solution 0.01 per cent	Saline	Cobra			Russell's viper		
				1 hr.	2 hrs.	21 hrs.	1 hr.	2 hrs.	21 hrs.
(1) Human red cell suspension.	1.0	1.00	—	—	—	—	+	+	+
	1.0	0.50	0.50	—	—	—	+	+	+
	1.0	0.25	0.75	—	—	—	+	+	+
	1.0	0.20	0.80	—	—	—	+	+	+
	1.0	0.10	0.90	—	—	—	+	+	+
	1.0	0.05	0.95	—	—	—	+	+	+
(2) Guinea-pig's red cell suspension.	1.0	1.00	—	—	—	—	+	+	+
	1.0	0.50	0.50	—	—	—	+	+	+
	1.0	0.25	0.75	—	—	—	+	+	+
	1.0	0.20	0.80	—	—	—	+	+	+
	1.0	0.10	0.90	—	—	—	+	+	+
	1.0	0.05	0.95	—	—	—	+	+	+
(3) Sheep's red cell suspension with lecithin 0.1 c.c. of 0.5 per cent emulsion.	1.0	1.00	—	—	—	—	+	+	+
	1.0	0.50	0.50	—	—	—	+	+	+
	1.0	0.25	0.75	—	—	—	+	+	+
	1.0	0.10	0.90	—	—	—	+	+	+
	1.0	0.05	0.95	—	—	—	+	+	+
	1.0	0.025	0.98	—	—	—	+	+	+
(4) Sheep's red cell suspension without lecithin.	1.0	1.00	—	—	—	—	+	+	+
	1.0	0.50	0.50	—	—	—	+	+	+
	1.0	0.25	0.75	—	—	—	+	+	+
	1.0	0.10	0.90	—	—	—	+	+	+
	1.0	0.05	0.95	—	—	—	+	+	+
	1.0	0.025	0.98	—	—	—	+	+	+

+ + + + + Complete hemolysis.
+ + + + + Doubtful.
+ + + + + No hemolysis.
+ + + + + Complete hemolysis of r.b.c. but the supernatant fluid clear.

When experiments were performed with this sterile venom solution and under strictly aseptic conditions, it was found that no hæmolysis took place even in the case of the cobra venom which is so strongly hæmolytic. Passing the venom solutions through the Seitz filter has, therefore, the effect of eliminating the hæmolysing fraction completely from the venom. The details of the experiments are set forth in the table.

From the table it appears that cobra venom has lost the power of hæmolysis altogether by being passed through the Seitz filter. The same experiments were repeated with red blood corpuscles obtained from guinea-pigs with almost identical results. Unfiltered cobra venom solutions in concentrations of 1 in 20,000 and 1 in 40,000, however, completely hæmolysed red blood corpuscles obtained from guinea-pigs within 10 minutes, whereas with human red blood corpuscles only a partial hæmolysis took place under those conditions, showing that the former are more susceptible to hæmolysis by cobra venom than the latter.

The next point to ascertain was whether the hæmolytic element was altogether eliminated by being passed through a Seitz filter or was merely inactivated by this process. It is a well-known fact that both cobra and Russell's viper venom which would not ordinarily hæmolysed red blood corpuscles obtained from sheep would do so in the presence of a very small amount of lecithin. The experiments in group (3) of the table will show that lecithin had no effect whatsoever on the filtered venom solutions with respect to hæmolysis.

The same experiments, when repeated with venom solutions that were not passed through the Seitz filter, gave the usual results. Both cobra and Russell's viper venom hæmolysed sheep's red blood corpuscles very readily in the presence of lecithin, as will be seen from group (3) of the table.

Experiments were also made to test whether the venom solutions had undergone any change with respect to their proteolytic activity by this process of filtration. It was found that with respect to the properties of dissolving fibrin, the liquefaction of gelatine and also the clotting of milk (rennetic activity) these venoms retain their activity almost unimpaired after filtration through a Seitz filter. Analysis was also made with respect to the protein constituents of the filtered and unfiltered venom solutions but no marked difference could be observed between them.

Pharmacological action.—In order to see

1	Corresponding to the loss of hæmolytic
2	25 Negative 25
3	Negative " Negative

ENTOMOLOGICAL FINDINGS

All the squirrels concerned in the experiments had their ectoparasites collected and examined. Here again an interesting and possibly suggestive contrast emerged in the findings in the two

Venom solution	Blood pressure	Respiration
1. Cobra (unfiltered).	Small but maintained rise.	Transitory dilatation of bronchi followed by sudden return to normal and very slight increase in amplitude and rate.
2. Do. (Seitz filtered).	No effect.	Slight increase in rate.
3. Russell's viper (unfiltered).	Marked and permanent fall.	Sudden increase in amplitude and rate showing constriction of the bronchi and stimulation of the centre followed by respiratory irregularity and spasmodic breathing.
4. Do. (Seitz filtered).	Slight maintained rise.	No effect.

With respect to the cobra venom the vascular effect is altogether absent in the filtered solution but no such marked change was observed as regards the respiratory effect. With the Russell's viper venom, however, we find that there is a marked change with respect to both these actions.

Discussion.—The results mentioned above suggest that by the process of filtration through Seitz filters either the hæmolytic element has been altogether eliminated or it has been inactivated in such a manner that it is incapable of being reactivated by lecithin. The former hypothesis appears to us to be the more probable one, as Houssay (1921) found that the hæmolytic substance of snake venom is absorbed by animal charcoal, the residual venom solution being non-hæmolytic. We believe that with the Seitz filter also a similar process of adsorption is responsible for the loss of hæmolytic property.

Experiments are in progress with a view to ascertaining the nature of this hæmolytic principle and also how far this process of filtration through Seitz filters affects the other properties of the venom solutions.

SUMMARY

1. Passing of the venom solutions (cobra and Russell's viper) through the Seitz filter renders them non-hæmolytic.

2. The Seitz-filtrate of venom solutions are not reactivated by lecithin.

3. In the filtrate from cobra venom solutions the vascular effect is altogether absent, the respiratory effect being only slightly affected, essential that both ticks and fleas under venom adequate attention in this area. marked

This can only be done by a properly and staffed whole-time enquiry and the is sufficiently important to warrant the diture which would be incurred by Vol. II, enquiry.

(Continued at foot of next page)

TABLE

HÆMOLYSIS.									
VENOM SOLUTIONS PASSED THROUGH SEITZ FILTER.				UNFILTERED VENOM SOLUTIONS.					
Serial no.	R.b.c. suspension	Venom solution 0.01 per cent	Saline	Cobra			Russell's viper		
				1 hr.	2 hrs.	21 hrs.	1 hr.	2 hrs.	21 hrs.
(1) Human red cell suspension.	1.0	1.00	—	—	—	—	—	—	—
	1.0	0.50	0.50	—	—	—	—	—	—
	1.0	0.25	0.75	—	—	—	—	—	—
	1.0	0.20	0.80	—	—	—	—	—	—
	1.0	0.10	0.90	—	—	—	—	—	—
	1.0	0.05	0.95	—	—	—	—	—	—
(2) Guinea-pig's red cell suspension.	1.0	1.00	—	—	—	—	—	—	—
	1.0	0.50	0.50	—	—	—	—	—	—
	1.0	0.25	0.75	—	—	—	—	—	—
	1.0	0.20	0.80	—	—	—	—	—	—
	1.0	0.10	0.90	—	—	—	—	—	—
	1.0	0.05	0.95	—	—	—	—	—	—
(3) Sheep's red cell suspension with lecithin 0.1 c.c. of 0.5 per cent emulsion.	1.0	1.00	—	—	—	—	—	—	—
	1.0	0.50	0.50	—	—	—	—	—	—
	1.0	0.25	0.75	—	—	—	—	—	—
	1.0	0.10	0.90	—	—	—	—	—	—
	1.0	0.05	0.95	—	—	—	—	—	—
	1.0	0.025	0.98	—	—	—	—	—	—
(4) Sheep's red cell suspension without lecithin.	1.0	1.00	—	—	—	—	—	—	—
	1.0	0.50	0.50	—	—	—	—	—	—
	1.0	0.25	0.75	—	—	—	—	—	—
	1.0	0.10	0.90	—	—	—	—	—	—
	1.0	0.05	0.95	—	—	—	—	—	—
	1.0	0.025	0.98	—	—	—	—	—	—

Complete hæmolysis.

Doubtful.

No hæmolysis.

Complete hæmolysis of r.b.c. but the supernatant fluid clear.

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AN INVESTIGATION ON THE EFFECTS OF EVIPAN SODIUM ON THE BLOOD SUGAR OF THE RABBIT

By S. PRASAD

and

BARID B. SEN*

(From the Department of Physiology, The Prince of Wales Medical College, Patna)

THE sodium salt of cyclohexenylmethyl-N-methyl barbituric acid (evipan sodium) is a comparatively new basal anæsthetic. It is supposed to have the property of inducing surgical anæsthesia for short periods of about 15 to 20 minutes. It has a wide margin of safety and so it has gained considerable popularity as a general anæsthetic in surgical procedures of short duration.

Anæsthetics in general have a considerable effect on the blood sugar. So far as the drugs of the barbituric acid group are concerned, contradictory results have been reported. While anæsthetic doses of barbiturates, according to some observers, cause no change in the blood sugar level of normal fasting animals, others have found marked hyperglycæmia, *e.g.*, Underhill and Sprunt (1927) with amytal on the rabbit, Weiss (1926) with amytal, medinal, and sodium iso-allyl propyl-barbiturate on the cat and the dog, and Bang (1913) with veronal on the rabbit. Kennedy and Narayana (1934) working with sodium evipan found no appreciable effect on the blood sugar in doses varying from 45 to 90 milligrammes per kilogramme of body weight in the guinea-pig and 40 to 100 milligrammes per kilogramme of body weight in the rabbit.

Considering the fact that other barbiturates do produce hyperglycæmia, as some experimenters report, we thought fit to reinvestigate whether this new anæsthetic, *i.e.*, evipan sodium, which also belongs to the barbituric acid group, has any effect on the blood sugar.

TECHNIQUE

Blood sugar estimation was done by Maclean's method which has given very satisfactory results for the last few years with one of us (S. P.).

Rabbits were employed all through the present observations. Blood samples were collected from the ear veins, the animals being treated with great gentleness so as to ensure as little excitement as possible. The anæsthetic was always prepared fresh and injected intraperitoneally in 5 per cent concentration.

The rabbits were starved overnight and experiments were carried out early next morning. The dose used, generally, was 60 milligrammes per kilogramme of body weight, but lower and higher doses, *i.e.*, 40 and 80 milligrammes per

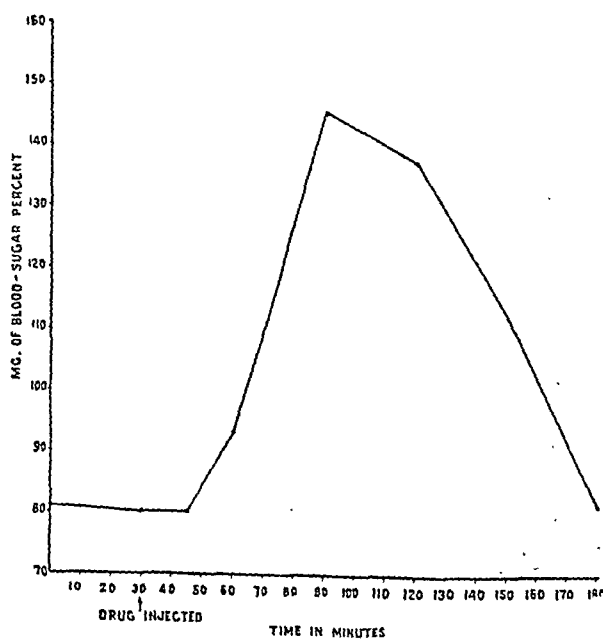
kilogramme, were also employed. Blood sugar was determined at intervals of half an hour for 2 to 3 hours. In some cases earlier samples were also taken. Control experiments were done by injecting saline intraperitoneally and the results were also confirmed by repeating the same experiment on each rabbit twice at intervals of 4 to 5 days.

RESULTS AND DISCUSSION

Soon after the injections of the evipan sodium in anæsthetic doses the animals began to shiver, respiration became hurried and their eyes rolled up and down. After a temporary period of restlessness, the animals became quiet and would lie down with the muscles relaxed. Some of the animals exhibited slight retraction of the head and opisthotonos. With a dose of 60 milligrammes per kilogramme of body weight hypnosis came on within 3 to 5 minutes and lasted on an average for 50 minutes. With a dose of 80 milligrammes per kilogramme the respiration was slowed down considerably and hypnosis came on within 2 minutes and lasted longer. Malloney and Hertz (1935) found that 60 milligrammes produced hypnosis 3 minutes after injection and this lasted for a period of 44 minutes on an average.

Blood sugar estimations of the rabbit under observation before and during anæsthesia showed a distinct rise as will be evident from

GRAPH



Rabbit, male, weight 1.66 gm.

The curve shows the effect of injecting 100 mgm. evipan sodium. The injection was given at the arrow mark.

the table below. The table shows the pre-anæsthetic blood sugar percentage, and the average blood sugar percentages during anæsthesia and recovery. In one experiment, however, instead of the usual rise, a fall in the blood

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sugar was noticed with a dose of 60 milligrammes per kilogramme. This was probably due to a high initial blood sugar level as a result of excitement.

It will also be seen that with a dose of 40 milligrammes per kilogramme of body weight the increase in blood sugar above the fasting level was about 9 per cent on an average; with a dose of 60 milligrammes per kilogramme the rise was about 22 per cent in a majority of experiments, although a group of 6 rabbits exhibited an average rise of even 50 per cent over the fasting level.

TABLE

Evipan sodium in mgm. per kgm. of body weight	BLOOD SUGAR IN MG.M. PER CENT		
	Fasting level	During anaesthesia, 1 hour after injection of evipan	During recovery, 1½ hours after injection of evipan
40	93	106	..
40	112	118	..
40	100	106	..
40	106	119	..
60	102	112	100
60	112	143	..
60	125	153	125
60	120	150	120
60	68	75	70
60	68	82	72
60	75	110	110
60	80	120	110
60	70	98	80
60	78	110	101
60	87	145	115
60	70	113	..
60	112	100	87
60	81	145	137

It was further found that the rise in blood sugar was evident half an hour after the injection, the highest level usually being attained in about an hour. Earlier samples did not exhibit any appreciable change. After an hour, the blood sugar began to fall gradually, returning to its normal level, generally, in 2 to 2½ hours from the time of injection of the anaesthetic. The curve in the graph is from a typical experiment; it shows that there was no rise for 15 minutes after the injection, the highest rise was obtained an hour after the injection and the blood sugar returned to the pre-anaesthetic level 2½ hours after the injection of the anaesthetic.

Evipan sodium thus behaves like the other drugs of the barbituric acid group in raising the blood sugar although Kennedy and Narayana (1934) report no change. Since the majority of workers have found increases in blood sugar with different barbiturates, it is quite probable that evipan sodium in common with the other barbiturates also raises the blood sugar. Regarding the mechanism of the rise in blood sugar it is probable that the sugar is released

(Continued at foot of next column)

FLUORESCEIN IN LEPRO REACTION

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and

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INTRODUCTION

THE beneficial effects obtained by the use of 'Mercurochrome-220 soluble', a fluorescein compound of mercury, in leprosy cases, especially in prolonged lepra reactions, in arthritis of leprosy as well as of undetermined origin, and in *Bacillus coli* septicæmias, etc., were first recorded in India, by the present writers in Rao and Ray (1932). Since then, other workers, notable among them being Muir and Chatterjee (1932 and 1933) and Chatterjee (1933), have attempted to study the action of Mercurochrome as well as that of one of its constituents, viz, fluorescein, in leprosy. Ryrie (1934) has further continued to study the influence of fluorescein on 'lepra reaction', and has concluded that in a fairly large proportion of such reacting cases, fluorescein appears to be beneficial.

In view of the favourable opinion expressed by Ryrie and also in view of the fact that we occasionally come across cases of prolonged reactions which are not much benefited by any accepted routine treatment, such as hospital regime, with potassium antimony tartrate injections supplemented by calcium therapy and salicylates by the mouth, etc., we thought it

(Continued from previous column)

from the liver as a result of liberation of adrenalin from the suprarenal medulla or by producing a disturbance in and around the thalamus as has been suggested by Weiss (1926) in the case of amytal.

SUMMARY

Evipan sodium in anaesthetic doses raises the blood sugar of the rabbit.

ACKNOWLEDGMENTS

We have to thank Professor Narayana, on whose suggestions and advice the observations were carried out. We have also to thank Havero Trading Company, Limited, Calcutta, for the supply of evipan sodium free of cost.

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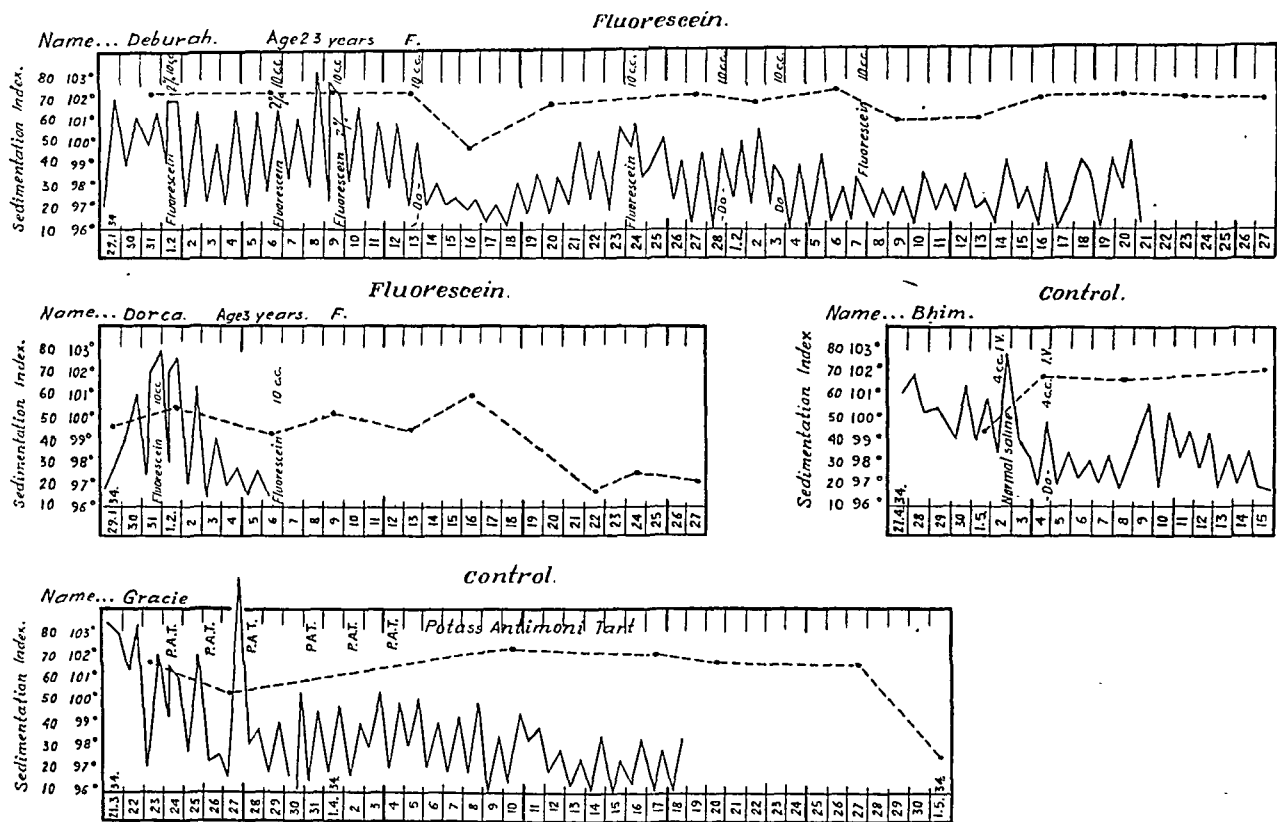
better to give a thorough trial of fluorescein, in reacting cases, with a view to assessing its merits *vis-à-vis* those of potassium antimony tartrate and other anti-reaction remedies in use at present, in the hope of discovering in fluorescein a valuable alternative method of treatment that could be adopted in cases which do not derive any benefit from other anti-reaction measures.

MATERIAL FOR STUDY

In this colony which contains more than 800 inmates of all types of leprosy, and where about 2,000 outpatients attend our outpatients' clinic every month for treatment, there is no dearth of lepra-reaction cases. But in the

the upward trend of the curve, as signifying a reaction. Others include even periodical nerve pains or myalgic pains in the category of lepra reactions. There seems to be no uniformity of opinion about what essential features should be present in a case, before it may be considered as reacting. Our present-day inadequate knowledge of the pathology of reactions, as well as their exact prognostic significance, no doubt contributes to this sort of loose thinking on the subject. We have therefore considered it necessary, at the outset, to define what we mean by reactions, as in the absence of such clear definition, any case of leprosy neuralgia or myalgia, or clinically observed advancing cases, are apt to be included amongst 'reacting

CHARTS 1 TO 4



interest of scientific accuracy we thought it better to confine our experimental treatment with fluorescein to our inmates only, as we have a fairly correct record of their antecedent illnesses, they live under controlled conditions in this institution and we are more in personal touch with them than with our outpatients. All cases of reaction that did not subside within four or five days of the onset were considered as severe reactions deserving hospitalization, and were admitted into the hospital.

In this connection we cannot help observing that there appears to be a great deal of confusion about what constitutes a lepra reaction. Some writers consider any appearance of small new lesions, in cases that are obviously on

cases' and entirely fallacious results claimed on behalf of the particular drug employed in such cases.

All cases showing fever of not less than a week's duration, the temperature rising moderately high, with the exacerbation of old existing lesions, and the formation of fairly numerous clinically-well-recognizable new lesions, with signs and symptoms indicative of constitutional disturbance, such as vomiting, diarrhoea or constipation, vertigo, anorexia and drowsiness, were considered as fairly severe reactions deserving admission into the hospital. Such a comprehensive standard had to be adopted for two reasons:—(1) Cases of mild reaction, such as those with fever of three or

four days' duration, the temperature not exceeding 101°F. or 102°F., with very few new lesions appearing, without exacerbations of the old lesions, and without signs of clinically recognizable constitutional disturbances, could be treated in their homes. Such cases could not be admitted into the hospital because of want of accommodation. Further, our experience here, as well as elsewhere, during the last eight years, has shown that such cases recover from their reaction naturally, without any kind of special treatment. (2) To study the influence of any new drug in such cases would be tantamount to self deception. If fluorescein has any beneficial effect at all on lepra reactions it would be manifested in well-marked lepra reaction cases that would not be affected merely by either a hospital regime, a dose of salts, or psychotherapy. And the reported beneficial influence should manifest itself in all cases of reaction of the same degree, irrespective of the rate or sex of the individual treated.

Twelve well-marked cases of fairly severe lepra reaction, conforming to our standards of severity enumerated above, were admitted into the hospital in the course of the first half of the year 1934 for observation and treatment. Nine of these were treated with ten cubic centimetres intravenously of a two per cent solution of Grublers' fluorescein (water-soluble), twice a week, or in a few cases, three times in two weeks, depending upon the tolerance of the patients and the response obtained, keeping a close watch on the temperature and erythrocyte sedimentation index which was determined, as a rule, just before administering the next dose of fluorescein. The sedimentation test was done weekly, even after the temperature reached the normal, with a view to ascertaining whether fluorescein had any delayed beneficial influence on the natural resistance factor. The usual technique was used in carrying out the erythrocyte sedimentation test, by taking the average of two readings of the first and second hours.

The required quantity of fluorescein solution was prepared freshly each day, just before use, and the injections were given by one of us (A. T. R.). The remaining three cases served as controls. One was treated with intravenous injections of potassium antimony tartrate on alternate days, four cubic centimetres of a one per cent solution in physiological saline, prepared freshly just before use, being the dose injected. The second was treated with plain physiological saline intravenously in four cubic centimetre doses. The third did not receive any special treatment excepting the routine hospital diet and care. In fact, the hospital regime was a common factor in all cases.

To exclude the possibility of errors introduced by other concomitant illness such as malaria, influenza and other febrile diseases, cases about which we had the slightest suspicion, were excluded from this experimental study. Thus,

every care was taken to assess the real value of fluorescein in uncomplicated well-marked lepra-reaction cases.

RESULTS

A glance through the temperature charts of the nine cases treated with fluorescein shows that after two to four injections of fluorescein, the temperature showed a tendency to return to the normal, thus confirming, partially, the opinion of Ryrie (*loc. cit.*). But a comparison of the charts of these cases with those of the three controls shows that, in the latter also, the same tendency of the temperature to return to normal was manifested. This tendency can be explained by the supervention of the debility factor impairing the reacting power of the individual. To confirm this explanation we have, first, the erythrocyte sedimentation index curve shown by a dotted line on the charts. A comparative study of this curve with that of the temperature clearly brings out the fact that though the temperature comes down after two or four injections of fluorescein, the sedimentation index still remains high, and shows no such rapid tendency to come down. It is a matter of common knowledge amongst leprosy workers of experience that a persistent high sedimentation index means prolonged debility. Second, we have the reported dangerous toxicity of fluorescein to experimental animals (Emerson and Anderson, 1934), which toxicity is very probably instrumental in precipitating the onset of the debility factor in human beings.

Fluorescein seems to have no favourable effect on the natural resistance factor and our observations indicate that it brings down the reaction (a) by a probable anti-pyretic effect, and/or (b) by hastening the onset of the debility factor, which, in control cases, as well as in untreated natural lepra-reaction cases, ultimately brings down the reaction. Comparing the first nine charts with those of the three control cases, we do not find any special noteworthy effect obtained by the use of fluorescein; and we have therefore to conclude that it possesses no particular advantage over potassium antimony tartrate, or other routine methods of anti-reaction treatment. In cases which are particularly susceptible to potassium antimony tartrate, or do not respond to other measures, fluorescein may be used.

SUMMARY AND CONCLUSIONS

(1) An experimental trial of fluorescein has been reported on in nine well-marked lepra-reaction cases with three control cases of similar reactions treated by (a) potassium antimony tartrate, (b) physiological saline, and (c) no special treatment, all the 12 cases being kept under hospital regime.

(2) A comparative study of the temperature charts of these cases shows that while two to four injections of fluorescein have an undoubted

anti-pyretic effect, no beneficial effect on the erythrocyte sedimentation index, which is a measure of the natural resistance, is evident. On the other hand, the latter continues to be high, indicating a prolonged debility.

(3) Even in the three control cases untreated with fluorescein, the same tendency to reach normal is shown by the temperature chart; and the same tendency to remain high is shown by the sedimentation index.

(4) These facts lead us to conclude that fluorescein has no particular advantage over potassium antimony tartrate or other routine methods of anti-reaction treatment, in use at present, and that it probably brings down the temperature by (a) an anti-pyretic effect and/or (b) by virtue of its toxic action hastening the onset of the debility factor which ultimately brings down a lepra reaction in untreated cases.

(5) We are of the opinion that fluorescein can be used as an alternative method of treatment in cases which do not tolerate the potassium antimony tartrate well or which do not respond to any other routine anti-reaction treatment.

ACKNOWLEDGMENT

Our grateful thanks are due to our assistant, Babu Andrew Bansriar, who helped us with the sedimentation tests and the drawing of the charts.

[Note.—This paper is of value only as conveying the impressions of two experienced leprosy workers. From a statistical point of view the lepra reactions are far too variable to allow conclusions to be drawn as to the value of any form of treatment unless at least 100 cases were included in each group.

The authors sent us 12 charts, but we are only able to include 4 of these. The charts can be analysed shortly as follows:—

In the fluorescein series, two cases remained febrile throughout the period of observation, 48 and 51 days, and in the others the temperatures subsided on the 40th, 14th, 11th, 9th, 7th, 6th and 5th days, respectively.

In the control cases it subsided on the 26th, 17th and 5th days, respectively.

The sedimentation index in the fluorescein series was low from the outset in one case, in 3 it remained high throughout, and in the rest it fell appreciably by the 62nd, 28th, 23rd, 15th and 13th days, respectively.

In the control series it remained high and unchanged in 2 cases and fell appreciably on the 42nd day in the other case.—EDITOR, I. M. G.]

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HETEROTOPIC BONE IN ELEPHANTOID TISSUES

By M. M. CRUICKSHANK

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Miss P., an Anglo-Indian lady, age 32 years, a resident of Malabar, was admitted to hospital on the 15th September, 1934, suffering from a gross condition of elephantiasis of both legs.

The swelling of the legs began 20 years ago and since 1923 the patient had suffered from attacks of fever with occasional rigors about once a month. During these attacks the legs became very painful and she was unable to get about.

Examination revealed enormous swelling of both legs with two large round masses of elephantoid tissue on the anterior and posterolateral aspects of the left leg near the ankle. The swelling on both legs was hard and indurated, allowing of no pitting on pressure. X-ray examination showed numerous, irregular and discrete areas of calcification scattered over the lateral aspects of both legs.

On the 20th September, my assistant, Mr. N. S. Narasimhan, F.R.C.S., excised the two local swellings on the left leg and removed strips of deep fascia. On the 2nd November and on the 12th November, I performed Kondolón's operation on the right leg, first on the medial then on the lateral aspects through incisions extending from the knee to the foot, and on the lateral aspect on to the dorsum of the foot. At these operations the deep fascia was found to be about $\frac{1}{4}$ inch thick, cutting almost like cartilage, and in it, on removal, could be demonstrated the calcified areas seen in the x-ray films and in addition areas of new bone formation, verified by microscopical examination, mostly situated in the fascia over the tibialis anticus.

One might add that all the deep fascia was completely removed from the knee to the ankle in the whole circumference of the right leg. The first operation affected the patient not at all; the second was attended with a degree of shock, which necessitated intravenous glucose-saline therapy. The patient is now able to get about comfortably, but the present improved condition is in a measure due to the removal of large amounts of elephantoid skin. It is too near these operations to speak of any lasting beneficial effects, but unfortunately my experience of Kondolón's operation has not been that of unqualified success.

Sir Harold Gillies is probably right when he considers that the lymphatic block lies in the inguinal glands and that these must be side-tracked if success is to be assured.

The chief interest in this case lies in the presence of heterotopic bone in the thick, indurated deep fascia. Development of bone in tissues remote from the skeleton is a rare but interesting process.

Heterotopic bone arises in connection with fibrous connective tissues in a state of functional disuse or death. The origin of the bone was formerly attributed to the activity of osteoblasts derived from distant sources. MacEwen conjectured that the heterotopic bone formation was due to the migration of osteoblasts from the blood stream into injured tissues, whilst ossification in the abdominal wall was attributed to injury of the xiphisternum or pubis at operation, with consequent liberation of osteoblasts. But osteoblasts may be absent from the area of new bone formation and the osteoblast or fibroblast is not essential for the formation of new bone.

According to Leriche and Policard any tissue, before it can exchange its identity, must be reduced to its primordial condition, must be de-differentiated to mesenchyme and then undergo a redifferentiation. From this primordial mass of liquefaction to which any connective tissue may be reduced, there may develop fibrous tissue, cartilage, or bone.

It is laid down by Leriche and Policard that bone formation is dependent upon an ossifiable medium, a sufficient blood supply and an adequate supply of calcium.

Pathological calcification is common in old tuberculous lymph nodes, in costal cartilages, in semilunar cartilages, in intervertebral discs, and in avascular tissues where metabolism is low and where the metabolic rate may be further reduced as the result perhaps of injury or infection or both. A heterotopic deposition of calcium must precede the formation of heterotopic bone.

The first problem then is to account for the deposit of calcium in devitalized tissues, there-after the formation of heterotopic bone can be explained according to Greig on those principles laid down by Leriche and Policard. Greig states: 'the prelude to calcification is loss of function; calcification is a sign of utter uselessness, of functional death, but ossification is a sign of life, and the precursor of ossification is calcification. Under conditions of low metabolism calcium from percolating blood serum or lymph is deposited in crystalline form'.

But how can this pathological deposition of calcium in tissues be explained, where no evidence of hypercalcaemia exists, for instance in old tuberculous lymph nodes, in costal cartilages, in intervertebral discs, in coeliotomy scars, in fascia lata, and—as in the present case—in the deep fascia of elephantoid limbs?

The mechanism of the deposition of calcium is probably a physico-chemical one.

Robison invokes the aid of an enzyme, 'phosphatase', with, as in the case of most enzymes, a reversible action, one hydrolytic the other synthetic.

The action of this enzyme, which Robison points out is present in tissues, which normally become the site of calcareous deposits, depends

on the hydrogen-ion concentration of tissue fluids, on the concentration of calcium ions, and probably upon many other unknown factors.

The enzyme or phosphatase theory, which at the moment has most experimental backing, depends on the fact that certain cells in certain tissues can secrete an active enzyme, which hydrolyses the salts of phosphoric esters brought to the tissue in the circulating blood. This causes local increase in the concentration of phosphate ions, with the precipitation of a complex carbinato-phosphate molecule, the bone salt, in or near the cells which secrete the enzyme.

This enzyme according to Greig may be liberated by the death of fibroblasts and may facilitate the transference of calcium from the colloidal state in which it exists in the blood serum and lymph to the condition in which it is present in bone.

Huggins has shown by transplanting bladder epithelium into the abdominal wall of the dog, and thus producing heterotopic ossification, that the ossifying tissue possesses a high phosphatase activity. It is concluded therefore that calcification is the result of phosphatase activity in a tissue, in which exists a suitable concentration of calcium ions, in which the hydrogen-ion concentration is optimal, and probably in addition a balance of factors yet unknown.

But this fails to explain why calcium is deposited in avascular devitalized tissues where there is no evidence of hypercalcaemia.

Though the local circulation of blood and lymph in avascular tissues is almost at a standstill, yet that circulation, be it of blood or of lymph only, must play an important part in the deposition of calcium. The whole question of phosphatase activity is however still problematical. The calcium having been deposited, then the postulates of Leriche and Policard come into play. A relative hyperaemia, whether the result of irritation due to the calcareous deposits, or whether the result of infection, occurs, with an increased transudation of serum. Decalcification of the calcareous deposit takes place as a result of the relative hyperaemia or of the synthetic action of phosphatase. The local excess of colloidal calcium is now available.

The hydrolytic action of phosphatase now comes into play and with the cutting off of the relative excess of blood supply, which also may be the result of enzyme action, the colloidal calcium is converted into the form required by bone and new bone is laid down. But what was the hormonal or other disturbance which called the dead tissue to life, and for what purpose? The perennial puzzle remains for solution.

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COMPOSTING OF TOWN REFUSE BY THE 'EDELMIST' PROCESS

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and

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CONVERSION of organic wastes, including night-soil, into manures has been practised for a number of years. Among the methods so far developed, those of Hutchinson and Richards (1921), Waksman and co-workers (1927), Fowler (1930) and Howard and Wad (1931) are most extensively adopted. These methods involve fermentation under essentially aerobic conditions. They are fairly rapid, but they also involve serious loss of both nitrogen and organic matter. Repeated attempts to raise the level of organic nitrogen, at any rate under Indian conditions, in the fermenting heap by the aerobic processes have not so far met with much success. Besides this particular aspect which, no doubt, is the most important from the agricultural point of view, there are several others, pertaining to the hygiene of the disposal which need careful study, e.g., (1) prevention of fly-breeding and (2) maintenance of high temperature at least in the early stages to destroy pathogenic and putrefactive organisms. These points are of considerable importance where night-soil is added as the source of available nitrogen for the decomposition of town refuse. Attempts to improve the hygiene of disposal and prevention of fly-breeding by chemical sprays have proved

costly. Sometimes the chemical used may even have an adverse effect on the course of decomposition by a modification of the micro-flora.

Among the other methods, the 'Edelmist' (hot fermentation) process originally developed by Krantz [Cunningham (1927), Rusehmann (1927), Boetskaul (1927), Fruwith (1928)] is best known. It is claimed to be hygienic and economical in regard to both nitrogen and organic matter. Quite apart from the above considerations, the Edelmist process should be regarded as a decided advance on ordinary methods in that it affords a means of controlling the fermentation of the manure. It was considered desirable therefore to make a systematic enquiry into the possibility of applying this process to the disposal of town refuse in India. The process, in short, consists in allowing the compost heap to ferment aerobically till the maximum temperature is attained. It is then pressed and packed tightly and maintained under anaerobic conditions for three to four months after which the manure is ready for application to land.

The method is being examined critically under both field and laboratory conditions with a view to standardizing the condition by which the disposal will be hygienic and will, at the same time, give a good yield of manure of a high organic nitrogen content. The enquiry has been divided into two sections—decomposition of (1) refuse in big chambers under field conditions or in small jars under laboratory conditions, and (2) a plant material like ragi straw in bottles. Only a few of the more important results obtained in the field study have been included in the following table.

TABLE

Form of nitrogen added to refuse	RATIO OF CARBON TO NITROGEN BEFORE FERMENTATION											
	30 : 1				20 : 1				10 : 1			
	Recovery of dry matter after composting (per cent)	Total N initially present (in kg.)	Total N after composting (in kg.)	Percentage of total N in the finished product	Recovery of dry matter after composting (per cent)	Total N initially present (in kg.)	Total N after composting (in kg.)	Percentage of total N in the finished product	Recovery of dry matter after composting (per cent)	Total N initially present (in kg.)	Total N after composting (in kg.)	Percentage of total N in the finished product
Ammonium sulphate.	86.4	1.50	1.53	1.79	83.6	2.30	2.22	2.49	82.0	3.5	3.00	3.62
Calcium cyanamide.	86.4	1.50	1.06	1.19	94.7	2.30	1.75	2.06	96.2	3.5	2.40	2.45
Sodium nitrate.	82.8	1.50	1.53	1.82	91.2	2.30	1.91	2.13	89.5	3.5	2.5	2.74
Night-soil	89.7	1.40	1.38	1.47	..	..	..	..	..	..	..	..

The results have been expressed as on 100 kg. of original material.

There was absolutely no smell at any time during the fermentation; nor was there any fly-breeding. The finished products—especially that originally treated with night-soil—had a pleasant earthy odour and crumbled readily to fine powder. In three of the sets there was complete recovery of nitrogen when the C-N ratio was 30 : 1 though there was some loss at the narrower ratios (especially at 10 : 1). In the latter case the loss was not entirely due to the formation of gaseous products. It was largely due to the heavy rains which percolated through the brick and clay walls and caused a part of the soluble salts to diffuse out. It may be noted, however, that the nitrogen contents of the finished products were higher than those obtained by the other methods in vogue. The losses in dry matter which are also below 20 per cent are lower than those obtained by the aerobic methods.

Experiments are in progress to further standardize the method; to determine the

optimum moisture content; to control the initial aerobic fermentation; to devise new types of cheap, water-proof cisterns; to compare the relative merits of fermentation in overground and underground pits; and to determine the best method of storing the finished product till it can be applied to land.

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A Mirror of Hospital Practice

NOTES ON A CASE OF ACUTE LEAD ENCEPHALOPATHY

By G. K. RANADIVE, M.B., B.S.
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A YOUNG MAN, aged 20 years, a tailor by occupation, was admitted into the Sassoon Hospital, Poona, on the 17th July, 1935, for acute pain in the abdomen. It was suspected to be a case of 'acute abdomen', so he was admitted on the surgical side where on investigation it was found to be more probably a case of lead colic. There was a history that once in two or three months for the last five years the patient used to get attacks of pain in the abdomen. The last attack was characterized by a very severe pain of a spasmodic nature and which continued for a couple of days. The pain was so severe that it could only be relieved by an injection of morphia.

The man was transferred to the medical side, and though he was free from abdominal pain, he appeared to be very depressed. He was very slow in answering questions and at times showed confusion of ideas. Sometimes when spoken to, he would not take any notice, appeared to be in a trance-like state and showed fine tremors of his lips.

The patient was thin, slightly anæmic, pulse rate ranging between 112 to 140; tongue coated, bowels constipated, typical blue lines on the gums, there was occasional slight rise of temperature, blood for malaria parasites—negative, urine—normal. The red cells showed no punctate basophilia.

Three or four days after his admission to the medical ward, general paresis of the upper and lower limbs developed. He was then given an intramuscular injection of calcium gluconate on three successive days with the idea of removing lead from the general circulation. There was difficulty in collecting the urine earlier, hence the chemical examination of urine was done after the injections of calcium. No lead was detected in the urine. The general paresis became gradually more marked and the mental condition became worse. There were signs of polyneuritis: flaccidity of muscles, deep reflexes lost. Wrist drop and foot drop were present on both sides. If the forearms were placed in a

pronated position the patient could supinate them. There was a rapid generalization of paresis. The voice was affected (adductor paresis). The affection pursued a course like an ascending paralysis associated with a rapid wasting of all the muscles. Ultimately the patient died on 2nd August, 1935, as a result of paralysis of the diaphragm.

Report of the chemical examination.—Lead was positively detected in the cerebro-spinal fluid where traces could be found on spectroscopic examination.

Points of special interest in this case are:—

1. Acute plumbism is not attributable to any definite cause. The patient was a tailor and owing to his generally impaired health the contamination with lead might have taken place on account of his occupation. Tailors generally suck thread prepared with lead beeswax.
2. The abdominal symptoms were so severe as to warrant a diagnosis of 'acute abdomen'.
3. There was no punctate basophilia.
4. The urine was negative for lead.
5. In this case lead showed special affinity for the nervous system. The affection of the brain was indicated by the confused state of mind which gradually became worse. The generalized paresis was quite characteristic of plumbism though it simulated Landry's ascending paralysis to a great extent. The only confirmatory evidence of plumbism was found in the cerebro-spinal fluid.

I wish to thank Col. Candy, Civil Surgeon, Poona, for permission to publish these notes.

[The evidence on which the diagnosis in this case was based seems to be rather slender. The failure to find lead in the urine in such a severe case of lead poisoning is too remarkable to be dismissed lightly. The question of acute diffuse myelitis, also associated with ascending paralysis, does not seem to have been considered.—EDITOR, I. M. G.]

A CASE OF MALIGNANT TUMOUR OF THE STOMACH IN A MALE WITH TRANSPOSITION OF THE VISCERA

By F. R. W. K. ALLEN, M.A., B.Ch. (Dub.)
MAJOR, I.M.S.

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A MALE, aged 30 years, was admitted to the Main Hospital, Raipur, on 20th July, 1935. He was very emaciated and complained that for the last four months he had been suffering from vomiting and constipation. It was found that his heart was transposed and that he had a tumour in his left hypochondriac region. He was unable to retain a barium meal long enough for a satisfactory x-ray examination but it was evident that hardly any food was passing through the pylorus which was seen to be on the left side. He was not really fit for operation but after some hesitation in order to relieve his painful vomiting laparotomy was performed under rectal ether on 8th August. It was found that the lymphatic glands were involved to such an extent that gastrectomy would be of no avail even if he could survive such a severe operation. After verifying that he had complete transposition of his abdominal viscera an anterior retrocolic gastro-jejunostomy was performed and his abdomen was closed. During the operation and for twelve hours afterwards he was given continuous intravenous 10 per cent glucose in normal saline at 45 drops per minute. He never vomited again after the operation and his abdominal wound healed perfectly. By 15th August he was able to eat pounded fish and his bowels were moving. He continued to make satisfactory progress for five days. He then began to suffer from diarrhoea and later passed undigested food in his motions. To compensate for a reduction in his diet it was decided to give him a blood transfusion but no volunteer could be found. He began to go down hill and died on 28th August, three weeks after the operation.

A CASE OF PYO-PERITONEUM

By NUR MOHAMMAD, M.S.M.F.

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S., a female, aged 30 years, pot-maker, was admitted into the hospital on 26th June, 1935, complaining of distension of abdomen, slight cough and extreme weakness for the last two and a half months.

History of the present illness.—Two and a half months back the patient woke early one morning with a very severe colicky pain starting in the umbilical region, and radiating all over the abdomen. The patient vomited twice. The condition subsided within about six hours and in the afternoon she felt a chill and developed fever which continued, and at the same time she developed a cough. After about three weeks, the patient noticed that her abdomen was slowly and steadily increasing in size. She then came for treatment.

Previous history.—No previous illness. She had had three children the last being born about nine months before the onset of her present illness.

Family history.—Nothing having any bearing on the present condition.

Physical examination.—The patient was weak and emaciated and could hardly walk about. She had pyorrhoea alveolaris and decayed teeth. The abdomen was distended and fairly tense but it moved fairly well with respiration. The superficial veins were distended and the caput medusae was well marked. The skin was dry and shining. There was no tenderness in any part of the abdomen. The fluid wave was very well marked across the abdomen. The flanks were dull on percussion and the dullness moved to the

dependent side on change of position. The heart, though weak and quick, was otherwise normal. The lungs showed signs of chronic bronchitis. The urine was quite normal. The temperature at the time of admission was 99°F. It ranged below 100°F.

Diagnosis and treatment.—The case was diagnosed as ascites and was treated on the usual lines for about a week but without any improvement. The abdomen slowly and steadily continued to increase in size and the patient complained of difficulty in breathing.

She was tapped on the 7th of July and thin greenish and very foul pus came out through the cannula. About five pints of the pus were drawn off, and the wound sealed with collodion. The patient did not improve after tapping. Her condition became worse and she died about 4 days afterwards.

Conclusion.—Clinically this case appeared to be one of cirrhosis of liver with ascites. There was no sign of any localized or generalized peritonitis, nor could any disease of the generative organs or spine be detected.

[The writer has not indicated the special circumstances that led him to adopt a line of expectant treatment when he found free pus in the peritoneal cavity.—EDITOR, I. M. G.]

EPHEDRINE, AND THE REDUCTION OF A STRANGULATED HERNIA*

By B. K. WADIA, M.B., L.O., B.S.C.

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W. J., aged 28 years, suffered from a right-sided hernia since childhood but this gave him no trouble until a few months ago. One day, recently, the hernia was found to be irreducible.

When I saw him three hours later, he was trying to push the hernia up into the abdomen and applying ice. Taxis for half an hour failing to reduce it, I injected atropine 1/60 gr. Finding taxis and ice still ineffective, I gave atropine 1/30 gr. two hours after and also a warm soap enema at moderate pressure, the can being held at a height of about 2 or 3 feet and the bowel contents evacuated.

These measures were ineffective and the patient refused to go to the hospital, so I gave him a $\frac{1}{2}$ grain tablet of ephedrine, with the idea that from its direct action on the splanchnic system it might act where atropine failed. I repeated the dose six hours later. An hour later, only a small knuckle of gut could be felt in the hernial sac, and this was fully reduced on further taxis, 15 hours after strangulation had occurred.

On a previous occasion a month earlier, the hernia was reduced in two hours after a single injection of atropine, but the patient was attended to in a little over an hour after the occurrence of strangulation. This time, however, perhaps because of the longer interval before the patient was first seen, atropine combined with an enema and ice applications seemed to fail completely, but later ephedrine proved successful.

It is possible that ephedrine succeeded and atropine failed in this case because the former has a direct action on the sympathetic splanchnic nerves and produces a stronger inhibitory action on the bowel than the latter, which only acts indirectly on the sympathetic nerves by paralysing the opposing vagal nerve endings.

* Rearranged by Editor.

Indian Medical Gazette

JANUARY

THE CONTROL OF THE DRUG TRADE

THE mills of government in India have the reputation for grinding slowly, but at the same time for grinding 'exceeding fine'. We do not know how far they are entitled to the latter part of their reputation—probably on the whole the claim has been justified—but no one will deny their slowness. There are times when a little more rapid, even if a little coarser, grinding would be welcome. The particular subject that we have in mind at the moment is the control of the sale and manufacture of drugs and the organization of the profession of pharmacy; for practical purposes they constitute one problem.

During the last half century, medical organization has advanced rapidly in India, medical colleges and schools have been built and are being run largely at government expense, thousands of medical men are turned out each year, and the standard of medical education is very carefully controlled by provincial medical councils and now by an all-India medical council. Public health organization developed later and is advancing less rapidly, nevertheless this has been advancing too, but pharmacy and the drug trade has been allowed to develop just as they pleased without the help, control or guidance of government.

It is perhaps only during the last quarter of a century that the contrast between the state of advancement of the medical profession and medical organization on the one hand, and the profession of pharmacy and the drug trade on the other, has become so marked in this country, and perhaps only during the last fifteen years—a period during which the drug trade throughout the world has developed so rapidly and the foundations of an important drug industry in this country have been laid—has the medical profession fully awakened to the grave dangers of the situation and commenced to agitate for some action to be taken by government. Each year for a number of years the Research Workers Conference passed a resolution urging an enquiry on this subject, by this and other means a certain amount of public attention was attracted to it, and eventually in 1930 the Government of India appointed a small committee to go into the whole question. This committee, of which Colonel Chopra was the chairman, visited all parts of India collecting evidence and presented its report in April 1931. The report was a well-reasoned and a comprehensive one; it contained a number of recommendations regarding the organization of the profession of pharmacy and the control of the drug trade and industry.

This report was well received by practically all those whom it concerned (except possibly the dishonest drug trader, and he did not appear in open opposition—as such). The only criticism levelled at it was that some of the measures recommended would cost more money than an impoverished country could at that time afford. But this did not apply to all the recommendations, and it does not seem a sufficient reason for shelving the whole report for a period of over four years—and shelved it must have been as we cannot be expected to believe that it could take four years to mastigate it, even into a completely amorphous state.

During the interval the state of affairs regarding the drug trade has become worse and incidents have occurred that have been quite legitimately described in the public press as 'scandalous'. It has been found that there is a flourishing trade in refilling with useless and possibly deleterious materials the bottles and ampoules bearing the names of well-known and reputable drug manufacturers and reselling them as the genuine article. In a case like this the manufacturers concerned can of course take legal action and get the offenders punished for fraud, but the legal machinery for dealing with even this type of blatant and dangerous dishonesty is cumbersome and the punishment meted out totally inadequate. In the first place, the fraud has to be detected and in the instances referred to it was obvious that it had escaped detection for some considerable time; this sort of thing could never happen in a country where there was any sort of control over the drug trade.

It is of course not only within the country that dishonest practices flourish. Dishonest traders in those European and other countries where there is little control over the export of drugs and medicines have been quick to take advantage of the state of affairs in India and not only import cheap and useless drugs, but have been known to buy up in their own countries condemned stocks of dangerous drugs, such as arsenicals, and time-expired and therefore useless (and possibly dangerous) biological products, and export them to this country.

In the circumstances action by the provincial governments alone would not be effective. It is a matter in which the Federal Government must act in conjunction with the provincial governments. We are not suggesting that an expensive and fully-developed scheme should be thrust upon the country, but a beginning must be made. There are many parts of schemes suggested by Colonel Chopra's committee that would not cost money, and for these the necessary legislation might be proceeded with immediately. It might be suggested that enactment alone would be ineffective but it would produce a moral effect and provide the necessary powers for pushing forward the

scheme immediately money becomes available. The scheme suggested by this committee for organization, registration and training of pharmacists could be carried out at a very small initial expenditure. Again, the existing provincial laboratories could be strengthened without involving the governments in any great capital outlay to carry out the testing of drugs; the addition of only two or three trained men to the existing staffs would probably be all that was necessary to compete with the work for the first few years, and as the work expanded so would the revenue arising therefrom also expand. Although it would obviously be advantageous to have a separate inspecting staff for the collection of samples of drugs in the retail market, this work could be done at first by inspectors of the excise department.

It should be a principle of governments to nurse very carefully the goose that lays the golden eggs. It might even be possible for them to go beyond the moral of the fable and to control their rapacity sufficiently to put aside some of the golden eggs for instituting a golden-egg-laying goose farm. Or, to return to actualities, as there has been an enormous increase in

the revenue derived from the duty on imported drugs during the last fifteen years, it is reasonable that some of this excess should be devoted to establishing laboratories at the principal ports for the testing and control of ordinary drugs, both those imported and those made locally, and a central consultative laboratory for dealing with the more complicated therapeutic agents. Nothing would help the drug industry in this country more than the establishment of efficient control of the manufacture and sale of drugs, and in time this indigenous industry would be in a position to support the whole organization for collecting samples and testing drugs made within the country, as it is only right that it should, just as some at least of the revenue from imported drugs should be devoted to their control.

We feel that the time has now come when medical progress as a whole in the country is being held up by this lack of organization of the profession of pharmacy and lack of control of the drug trade, and we sincerely hope that it will be possible for the government to make some definite move in the matter at an early date.

Special Articles

THE TREND OF IMMUNITY STUDIES IN MALARIA

By R. N. CHOPRA, C.I.E., K.H.P., M.A., M.D. (Cantab.)
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and

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THE problem of immunity in malaria has been the subject of universal attention in view of the fact that the disease has become a standing problem in different important localities of the world where it takes a heavy toll of human lives year after year. In India, which is one of the countries that suffer most, both preventive and curative measures have been subjects of interest with a view to eradicating the evil.

Studies on the problem of immunity really began in 1901 when Daniels made certain observations regarding the tolerance acquired by Europeans and natives residing in the hyperendemic areas of Central Africa. He also pointed out the difference in the nature of immunity acquired by these two races. The work of Christophers (1924) in India also corroborates the observations of Daniels. The period of immunization for Indians residing in the hyperendemic areas was divided by Christophers into three different parts, each characterized by different degrees of splenic

enlargement. After the end of the immunization period, which according to both the above workers covered almost 15 years of life in childhood, the man becomes immune with a latent infection with scanty parasites in the blood. The work of Sarkar (1932) in the Chittagong Hill tracts and also in the tea gardens of Jalpaiguri Duars corroborates the above observation. Gill (1914) further drew attention to the fact that an interruption in infection destroys the immunity and brings about severe epidemics of malaria. This is very interesting from the Indian point of view, specially for those places where malaria is seasonal.

In addition to these epidemiological studies on immunity in malaria, experimental studies on human malaria by different workers, such as Yorke and Macfie (1924), Nicole and Steel (1925), and James (1931), have also brought out many interesting facts. From their observations it is now evident that man varies in his natural resistance to infection and proves refractory to inoculation. A man can develop immunity after an attack of malaria followed by spontaneous recovery from clinical manifestations, but he may still retain some parasites for months. Experimental work on bird and monkey malaria by Gringrich (1932), the Taliaferros (1928), Sinton and Mulligan (1932), Krishnan (1933) and others, also supply information of great importance. Thus, it is

shown that in these malarial cases an immunity is developed which is generally found to be associated with a latent infection and which lasts for a fairly long time. Krishnan *et al.* (1933a and 1934) in their exhaustive work took splenectomy as a means of detecting latent infection. They showed that in monkeys of the susceptible type immunity in a large percentage of cases is associated with a latent infection lasting for about a year and a half after recovery from the acute primary attack, while in a small percentage no latency could be demonstrated. In the resistant species, however, it was found that in a fairly large percentage of cases with acquired immunity, no latent infection could be observed. In birds on the other hand, when the latent infection is totally cured, the immunity disappears.

Investigation into the mechanism of such an immunity as is commonly observed in malaria really began in 1913 with Ziemann's work. Earlier investigators were all unanimous in their conception of protozoal immunity which they believed to be alike in nature to the immunity in bacterial infections. But unfortunately all the attempts made by different workers, Ziemann, Thomson (1918), Kingsbury (1927), and the Taliaferros and Fisher (1927), to demonstrate the presence of an antibody in the blood of human malarial cases by the complement fixation test or by the precipitin test were of no practical value. A few workers, such as Henry (1928), claimed to have diagnosed malaria in human subjects serologically, while Sotiriades and Kauders produced some evidence to show that serum from persons with chronic infection was useful in curing malaria in newly-infected cases. But in spite of all these even Thomson (1933), who is a staunch believer in the existence of an antibody in malaria, has been forced to state that the investigations carried out in this direction are, after all, preliminary and inconclusive; moreover, they are in some cases extremely misleading. Of course, Thomson is of opinion that the obstacle met with in work of such nature is mainly due to the difficulty of obtaining an antigen free from non-specific protein bodies.

The search for an antibody in bird malaria by Taliaferro met with little success. He also observed that serum from birds with latent infection was without action in preventing malaria in normal birds. This failure led Cannon and Taliaferro (1931) to investigate into the cellular reaction in infection and immunity; here they observed some interesting facts. They found that the malarial parasites in birds were phagocytosed at all stages of their development in acute primary infections. They also found evidence of a distinct activation of the mesenchyme which reached its maximum at the time of crisis during which the parasites disappear rapidly from the blood. This activity was found to be equally retained even in the

latent stage. From this it is evident that the mechanism of immunity in birds is cellular and consists of an increased rate of phagocytosis by the reticulo-endothelial system, specially of the spleen and liver. They, however, still believed that some kind of antibody not demonstrable by the ordinary technique was formed, or that the macrophages acquired some specific activity stimulated by some opsonic antibody. In the case of monkey malaria, Taliaferro also came to similar conclusions regarding the presence of an opsonic antibody. Sinton and Mulligan in the course of their extensive researches on monkey malaria tried to demonstrate the presence of antibodies by intradermal reactions, following the injection of antigens of autolysed parasites into monkeys. Although the characteristic reactions appeared in this case as in the case of bacterial autolysates, it did not, however, prove the existence of antibodies, since the consensus of opinion is that there is very little correlation between the occurrence of this reaction and the presence of demonstrable antibodies. But Sinton and Mulligan are of opinion that such delayed intradermal reactions are mainly intracellular rather than humoral, and are consequent upon a reaction between the antigen and an intracellular antibody in the reticulo-endothelial system. Although there might be some hypersensitiveness of the reticulo-endothelial system due to the products of disintegration of other proteins, it was comparatively slight. The major part was due to the specific products derived from the plasmodia used. According to these workers therefore the antibody is not humoral but cellular.

From these observations it seems clear that in the malaria of birds and monkeys the activity of the reticulo-endothelial cells in removing parasites by phagocytosis is a very important factor in the control of the disease. In human malaria the phenomenon of phagocytosis was observed by Golgi as early as 1888, specially in benign tertian and quartan cases. Marchiafava and Bignami in 1894 noted that in malignant tertian malaria the leucocytes were engulfing not only parasite and cell debris, but also the parasites and even the parasitized red cells, and thus removing them from the blood. This observation is very important since it removed an age-long misunderstanding that phagocytes remove only the debris and dead matter and have got nothing to do with the removal of living parasites or red cells. Recent observations have, however, confirmed the observations of Marchiafava and Bignami, not only in the case of malignant tertian malaria but also in benign tertian and quartan cases. With the development of a supra-vital staining technique (*vide* Napier, Krishnan and Lall, 1932) matters have been made easier. It must also be noted in this connection that, while Golgi was of opinion that phagocytosis is a controlling factor in benign tertian and quartan cases, Marchiafava

and Bignami were unable to admit that phagocytosis can completely control the disease in malignant tertian malaria.

From these observations there can be no doubt regarding the importance of phagocytosis as a means of controlling malarial infection. The reticulo-endothelial system of the spleen and the liver shows active phagocytosis of the parasites and the pigment. The activity of the macrophages is seen to a lesser extent in the bone marrow and other organs of the body. This active engulfing of the pigmented parasites may be seen in the peripheral blood stream also where both the macrophages and microphages (mononuclears and neutrophile polymorphonuclears, respectively) are actively phagocytic. So far as is known lymphocytes and eosinophiles are not concerned with the destruction of either parasites or pigment. It is also stated that the endothelial cells at the lining of blood vessels, for example those of the brain, ingest parasites and pigment, but this has not been determined with certainty. The work of Krishnan *et al.* (1933) with a supra-vital staining technique has produced evidence to show that in the process of phagocytosis in malaria the monocytes and the histiocytes are the principal cells that are stimulated.

Since the macrophages have been found to phagocytose both malarial parasites and parasitized red cells, the main problem of malarial immunity now rests upon the point as to how this phagocytosis takes place. The phenomenon, as it occurs in malaria, has been found by Krishnan to be attended with a stimulation of the reticulo-endothelial system as observed by its mobilization and proliferation and also in increased functional activation that consists in the approach of these macrophages toward parasites and infected red cells and the final ingestion of the latter by the former. A knowledge of the mechanism controlling these three processes can alone solve the problem of phagocytosis and it is only after an insight into these processes has been acquired that any possibility of artificially inducing immunity in malaria in man can come up for consideration.

In order that phagocytosis may take place a phagocyte and a parasite or an infected red cell must approach sufficiently close to each other. It is, however, known that leucocytes, parasites and red cells are all negatively charged. Hence an approach of one towards the other always takes place against an electrical force of repulsion to overcome which some work must be done.

In the case of bacterial infections Reeshold was the first to demonstrate that the negative charge of bacteria when they were sensitized was reduced. This has been confirmed by Shibley in 1924. The fact, that bacteria on sensitization by an immune serum become liable to agglutination and phagocytosis, suggests that

both agglutination and phagocytosis are facilitated by a reduction in the electric charge on bacteria, owing to which the work done against electrical repulsion is diminished and the bacteria can come near each other or near the phagocytes and coalesce. Thus it is evident that both the processes of agglutination and phagocytosis resemble the coagulation of colloids where charged particles, on the reduction of their electric charge, approach near each other and conglomerate.

Northrop and Freund (1924) showed that the potential of the red corpuscles sensitized with specific immune serum in a bacterial infection was also reduced. This reduction took place to a degree depending upon the valency of the electrolyte present. Brown and Broom (1929) showed that, on sensitization in a bacterial infection, the charge of both red blood cells and bacteria present in the blood is reduced in proportion to the strength of the immune serum used.

Brown (1933), at the suggestion of Findlay, extended his work on charge measurement to red blood cells in malarial cases, to see whether the electrical charge on red cells suffered any reduction due to malarial infection, as happens in the case of bacterial infection.

The idea underlying such a piece of work was that if any reduction in the electrical charge of red blood cells in malarial infection, as compared to that in normal subjects, could be found, then from the analogy of the association of the antibody formation with charge reduction, as demonstrated in bacterial infections, this finding might support the theory of antibody formation in malaria.

The extensive work of Brown (1933a) did in actual fact show that the electric charge on red cells in malaria was reduced as compared to that in normal subjects, and that the reduction of charge was progressive and proportionate to the parasite rate. Brown and Broom (1935) also produced evidence to show that the reduction in electrical charge promoted phagocytosis and that any interference with the reduction interfered with the phagocytosis as well. Regarding the influence of serum in malarial immunity he showed that serum from a bird with latent infection reduced the charge on red blood cells from a normal bird, but that this action on the part of the serum was purely non-specific since reduction in charge could also be observed in the case of red cells from the blood of any other species of animal and even in the case of bacteria. This non-specificity does not however give any definite indication regarding the formation of specific antibodies. He, however, attacked the problem from a different point of view. With the infection of *Trypanosoma equiperdum* he showed that the reduction of the electrical charge of red cells occurred not when the infection was acute but when a treatment of Bayer

205 was given. The time and the condition of the charge reduction however coincided with those of the appearance of antibodies in the blood. This association of charge reduction with the appearance of antibodies in the blood, in all probability, indicated that the mechanism of charge reduction in malaria was similar to that in the present case and that some specific antibodies might possibly be formed in malarial cases also. From a serological point of view he tried to establish the same thing. Ledingham (1907) showed that immunity in diphtheria in horses is associated with an increase in the globulin portion of the blood serum. Similar association of antibodies has been observed by different workers in different bacterial infections. In malaria also this globulin fraction has been observed to increase both by Lloyd and Paul (1928) and by Chopra, Mukherjee and Sen (1935). Brown noted a great charge-reducing action of the globulins of blood sera. This increase in the globulin fraction as well as a consequent diminution of electric charge pointed to the possibility of antibody being formed in this case also. Moreover, the fact that the malarial immunity, as observed, is of a specific nature, since an immunity acquired against one strain cannot prevent infection with another, again points to the possibility of the formation of a specific antibody in this case also.

Findlay and Brown (1934) in a recent paper have produced evidence to show that serum from a bird with latent infection can sensitize the infected cells in another bird provided that such infected cells are small in number; also that blood from a canary which is recovering from an acute attack produces infection less readily than the blood from the same canary at the beginning of the attack, the number of infected cells being the same in each case. In spite of these observations and of evidence from analogy to prove the existence of an antibody in the blood, Findlay and Brown have not been able to explain the non-specific action of serum in such cases. In fact they have admitted that the action of serum is both specific and non-specific. The specific action occurs only when the phagocytosis of the parasites takes place during their extra-cellular existence. This is very suggestive, since such is the case in bacterial infection, as bacteria usually remain in the circulation and the phagocytosis of bacteria is due to the specific action of serum. The non-specific action consists in the activation of the reticulo-endothelial system and also in serological changes in the blood.

To sum up, therefore, the present position of immunity, it may safely be said that our whole conception of the mechanism centres round the possibility of the formation of an antibody. Although the existence of such specific antibodies have not been directly demonstrated, indirect evidence from an analogy of the physical and serological behaviour of blood in both

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The work of Chopra and Chaudhury (1933) on Indian strains of malaria in human subjects showed that the variation of electrical charge was not as regular as Brown observed in cases of bird malaria. The electrical charge varies in all possible ways. In some instances an increase above the average normal value was observed, while in others both equality and reduction were found. These observations, however, evidently indicated that the mechanism by means of which phagocytosis of red cells were brought about was not as simple as Brown suggested. Over and above this it threw some doubt on the existence, in such cases, of an antibody that brings about a lowering of the electric charge of red blood cells, because the charge was not found to be lowered in all cases.

Quite recently Chopra, Mukherjee and Krishnan (1935) took up this problem again to examine what would be the factors responsible for such irregular variation in electric charge on red cells and how far the electric charge would go to explain the facts about phagocytosis observed herein. The work was carried out on monkeys heavily infected with *Plasmodium knowlesi*, nearly 70 per cent of the red cells being infected. As observed from a measurement of the migration velocity of red cells in an electric field, it was observed that there was a fundamental difference between the healthy and the infected red cells of an infected blood specimen. The charge on the infected cells in general was lower than that on the healthy cells. This observation was very interesting since none of the previous workers could detect any difference between the electrical charges of infected and uninfected red cells. The next point observed was that the charge on the infected cells was dependent upon the stage of the parasites' growth within the cell. In the ring stage, infected cells showed a charge slightly higher than normal, while in the fully-mature schizont stage the charge was much lower. These observations directly give a clue to the peculiar and irregular variation of electrical charge as observed by Chopra and Chaudhury (*loc. cit.*). They also indicate that since electrical charge controls the approach of a phagocyte to a red cell, red cells with the fully-mature schizont stage of parasite within them are more liable to be phagocytosed. The inferences arrived at are, therefore, interesting and have practical

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significance. An explanation as to why the charge of a red cell, with fully-mature schizonts in it, is less than normal seems to be obvious when we consider the fact that the parasite within the cell lives and grows at the expense of the latter, as a result of which the chemical composition of the entire cell, including both the interior and the exterior, undergoes a change. The deterioration of the surface probably brings about an alteration in the electrical charge. A small increase of charge when the parasite enters the cell and is in the ring form is also not difficult to understand, because as soon as a parasite comes in contact with a red cell the common surface of contact cannot have any charge, which distributes itself on the total free surface. Hence owing to the distribution of the same charge on a smaller surface the total charge of the cell increases. The third point observed in this connection is that reticulocytes have got the same charge as the adult cells and hence, from an electrical point of view, there is no reason why reticulocytes should not be infected with parasites as is the case with adult red cells. In one blood specimen, infected reticulocytes were actually observed (Krishnan, Chopra and Mukherjee, 1935). The relative freedom of these may be understood on the basis of a simple consideration of the mathematics of probability, inasmuch as the number of reticulocytes in blood being very small, the chances of their meeting parasites during the short extra-cellular existence of the latter are ordinarily very small.

The considerations based upon the knowledge of the electrical charge of red cells are, therefore, very helpful in understanding some of the behaviour observed in malarial blood. When these considerations of electric charge are further extended to the understanding of the mechanism of phagocytosis, the subject becomes still more interesting. The relationship between the electrical charge of red blood cells and the phagocytosis thereof is governed by the laws of collision between charged particles as in colloids. The mathematical expression as deduced from the above considerations require the knowledge of the electrical charge of white cells and the di-electric nature of the plasma. It is a known fact that, where repulsive forces due to electrical charge come in, the charges on both the particles acted on by such forces should be taken into consideration. The di-electric nature of the medium (here plasma) which separates these two charged bodies should also be taken into account since it is a well-known fact that besides the electrical charge of the repelling particles the nature of the medium also determines the actual magnitude of electrical force between the cells. From the mathematical expression again, it has been shown in the paper mentioned above that a small change in the medium may bring about a considerable alteration in the magnitudes of the electrical

forces. It is, therefore, evident that, so far as phagocytosis is concerned, the consideration of the electrical charge on the red cells is not enough. The charge on the white cells and the alterations in the plasma are also important and according to the recent work in this laboratory it appears that the changes in the plasma are perhaps more important than the electrical charges on the individual cells (Krishnan, 1936).

It is, however, known that some of the constituents of blood plasma undergo changes in the course of malarial infection. Thus euglobulin has been observed to increase, albumin to decrease and cholesterol also to decrease. Such changes obviously produce alterations in the magnitude of the force of electrical repulsion, which is a determining factor in bringing the charged particles close together and thereby in phagocytosis. In the absence of any definite proof as to the existence of an antibody in the blood and also in view of the fact that the variation of electrical charge is not as regular in all cases as shown by Brown, the quota contributed by the biochemical alterations in the blood in the explanation of such facts seems to be full of possibilities.

Further work in this direction is in progress to assess the rôle of biochemical changes in the plasma, and, if it is found that biochemical alterations are as important as is indicated by the mathematical expression deduced for phagocytosis, the question of artificially inducing such alterations in the blood may come up for consideration for the purpose of promoting immunity against this disease.

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(Continued at foot of next column)

MEDICAL RESEARCH IN INDIA*

By G. G. JOLLY, C.I.E., V.H.S.

LIEUTENANT-COLONEL, I.M.S.

• Officiating Public Health Commissioner with the Government of India, New Delhi

THE present occasion when the 13th Conference of Medical Research Workers in India is meeting here in Calcutta is a suitable opportunity to invite your attention for a few minutes to the subject of Medical Research in its relation to Health. My first remarks will be historical to bring you up to date with the present position in India.

Less than seventy years ago the Government of India appointed two medical men, Drs. Lewis and Cunningham, as special assistants to the sanitary commissioner with the Government of India, for the purpose of utilizing scientific investigations for the benefit of public health. The great need at that time was the initiation of scientific investigation into disease problems particularly with the aid of the then new but rapidly developing methods of bacteriology. Both these officers were research workers and both achieved distinction as such. Lewis was a pioneer in parasitology who made important discoveries in connection with the parasite cause of elephantiasis and the group of blood parasites known as the trypanosomes, members of which cause sleeping sickness in man and 'surra' in horses. Cunningham, ten years after his appointment under the Sanitary Commissioner, was given the chair of physiology in this town and held it for 18 years during which he managed a small laboratory, the only one of its kind in India.

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significance. An explanation as to why the charge of a red cell, with fully-mature schizonts in it, is less than normal seems to be obvious when we consider the fact that the parasite within the cell lives and grows at the expense of the latter, as a result of which the chemical composition of the entire cell, including both the interior and the exterior, undergoes a change. The deterioration of the surface probably brings about an alteration in the electrical charge. A small increase of charge when the parasite enters the cell and is in the ring form is also not difficult to understand, because as soon as a parasite comes in contact with a red cell the common surface of contact cannot have any charge, which distributes itself on the total free surface. Hence owing to the distribution of the same charge on a smaller surface the total charge of the cell increases. The third point observed in this connection is that reticulocytes have got the same charge as the adult cells and hence, from an electrical point of view, there is no reason why reticulocytes should not be infected with parasites as is the case with adult red cells. In one blood specimen, infected reticulocytes were actually observed (Krishnan, Chopra and Mukherjee, 1935). The relative freedom of these may be understood on the basis of a simple consideration of the mathematics of probability, inasmuch as the number of reticulocytes in blood being very small, the chances of their meeting parasites during the short extra-cellular existence of the latter are ordinarily very small.

The considerations based upon the knowledge of the electrical charge of red cells are, therefore, very helpful in understanding some of the behaviour observed in malarial blood. When these considerations of electric charge are further extended to the understanding of the mechanism of phagocytosis, the subject becomes still more interesting. The relationship between the electrical charge of red blood cells and the phagocytosis thereof is governed by the laws of collision between charged particles as in colloids. The mathematical expression as deduced from the above considerations require the knowledge of the electrical charge of white cells and the di-electric nature of the plasma. It is a known fact that, where repulsive forces due to electrical charge come in, the charges on both the particles acted on by such forces should be taken into consideration. The di-electric nature of the medium (here plasma) which separates these two charged bodies should also be taken into account since it is a well-known fact that besides the electrical charge of the repelling particles the nature of the medium also determines the actual magnitude of electrical force between the cells. From the mathematical expression again, it has been shown in the paper mentioned above that a small change in the medium may bring about a considerable alteration in the magnitudes of the electrical

forces. It is, therefore, evident that phagocytosis is concerned, the consideration of the electrical charge on the red cell is not enough. The charge on the white cells and alterations in the plasma are also important. According to the recent work in this connection it appears that the changes in the plasma are perhaps more important than the changes in the charges on the individual cells (Krishnan).

It is, however, known that some constituents of blood plasma undergo alterations in the course of malarial infection. Euglobulin has been observed to decrease and cholesterol to increase. Such changes obviously alter the magnitude of the electrical repulsion, which is a determining factor in bringing the charged particles together and thereby in phagocytosis. In the absence of any definite proof as to the role of an antibody in the blood and also of the fact that the variation of electrical charge is not as regular in all cases as in Brown, the quota contributed by the blood alterations in the blood in the explanation of such facts seems to be full of possibilities.

Further work in this direction is in progress to assess the rôle of biochemical changes in plasma, and, if it is found that biochemical alterations are as important as is indicated by the mathematical expression deduced from phagocytosis, the question of artificially inducing alterations in the blood may come up for consideration for the purpose of promoting immunity against this disease.

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MEDICAL RESEARCH IN INDIA*

By G. G. JOLLY, C.I.E., V.H.S.

LIEUTENANT-COLONEL, I.M.S.

• Officiating Public Health Commissioner with the Government of India, New Delhi

THE present occasion when the 13th Conference of Medical Research Workers in India is meeting here in Calcutta is a suitable opportunity to invite your attention for a few minutes to the subject of Medical Research in its relation to Health. My first remarks will be historical to bring you up to date with the present position in India.

Less than seventy years ago the Government of India appointed two medical men, Drs. Lewis and Cunningham, as special assistants to the sanitary commissioner with the Government of India, for the purpose of utilizing scientific investigations for the benefit of public health. The great need at that time was the initiation of scientific investigation into disease problems particularly with the aid of the then new but rapidly developing methods of bacteriology. Both these officers were research workers and both achieved distinction as such. Lewis was a pioneer in parasitology who made important discoveries in connection with the parasite cause of elephantiasis and the group of blood parasites known as the trypanosomes, members of which cause sleeping sickness in man and 'surra' in horses. Cunningham, ten years after his appointment under the Sanitary Commissioner, was given the chair of physiology in this town and held it for 18 years during which he managed a small laboratory, the only one of its kind in India.

The date 1869 then marks the beginning of a period of active development of medical research in India. In the decades that followed, progress has been rapid and laboratories and institutions for research have been built in many parts of India.

In 1896 on the introduction of plague at Bombay the bacteriologist, Haffkine, transferred from Bengal, where he had been engaged on anti-cholera inoculation work, opened in temporary quarters his first plague laboratory which after various moves was finally located on a larger scale in old Government House, Parel, where the Haffkine Institute remains as his memorial and still produces for India the plague vaccine which he first created.

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The Pasteur Institute of India was founded at Kasauli in 1900, a similar institute at Coonoor in 1903. The King Institute of Preventive Medicine at Guindy, Madras, was opened in 1904 and the Central Research Institute, Kasauli, in 1906.

In 1916 Burma opened its Pasteur Institute in Rangoon and Assam followed with a similar one at Shillong in 1917.

The opening of the Calcutta School of Tropical Medicine in 1920 and the notable part played in its foundation by two illustrious Calcutta doctors, Pardey Lukis and Leonard Rogers, will be recalled by some here to-day, while most of you will remember well its distinguished first Director, Sir John Megaw, who like Sir Leonard Rogers still takes the deepest interest in its fortunes. Last, I must mention the All-India Institute of Hygiene and Public Health, like the Tropical School a combined teaching and research institute, but whose foundation we owe to a trust which has probably done more for human welfare throughout the world than any similar body—the Rockefeller Foundation.

I come now to two events of much importance to the organization of medical research in India. The first was the creation in 1906 of a bacteriological department under the Government of India. Not all research workers came into this department, but the officers employed in the various Government laboratories throughout India, in which medical research was carried out, were linked together in a cadre and given improved conditions. With minor modifications this bacteriological department persists though its name has been changed to 'medical research department' and from it the various Government research laboratories whether central or provincial are staffed.

The second important event was the constitution in 1911 of an organization for research known as the 'Indian Research Fund Association' and it is interesting to note that its creation preceded that of the Medical Research Council in England which only came into being during the Great War. The formation of the Indian Research Fund Association was largely due to the vision and administrative ability of a distinguished servant of India, Sir Harcourt Butler. Its original objects were the encouragement of medical research by financing approved enquiries and the supply of suitable research workers. The rules of the association do not restrict us to any special lines of medical research except that it is laid down that research into communicable disease should specially be carried out and in practice the funds of the association have been largely devoted to investigations into the major endemic and epidemic diseases of India.

For finance the association depended upon an annual Government grant of five lakhs of rupees. Its control is by a representative governing body which has the Government of

India Member of Education, Health and Lands as its chairman. Technical advice on the many aspects of medical research is supplied by a scientific advisory board of experts under the chairmanship of the Director-General, Indian Medical Service, while the Public Health Commissioner with the Government of India is honorary secretary both to the governing body and to the scientific advisory board.

The association has its own publication—the *Indian Journal of Medical Research*—which has won for itself a high international reputation. It also issues 'memoirs' on special subjects from time to time.

While the bacteriological department, or as it is now called the medical research department, is a cadre of Government officers, the Indian Research Fund Association is not restricted to such officers in its choice of research workers and in fact employs a large number of private workers in its various enquiries.

During the 65 years that have elapsed since the appointment of Drs. Lewis and Cunningham, a vast amount of medical research has been carried out, ranging over practically every disease that is of importance in this country. Malaria, plague, rabies, relapsing fever, typhus fever in which investigation we lost a distinguished research worker—Major Cragg, cholera, typhoid, dysentery, leprosy, kala-azar, beri-beri, sprue, oriental sore; these and many other diseases have been investigated and have yielded up many of their secrets.

In some cases a great discovery has been made by a lone worker and we have Ronald Ross's mingled feelings of wonder and awe when 37 years ago he discovered here in Calcutta the mosquito transmission of malaria, preserved for all time in his lines.

This day relenting God,
Hath placed within my hand,
A wondrous thing; and God
Be praised. At his Command,

Seeking His secret deeds
With tears and toiling breath,
I find thy cunning seeds,
O million-murdering Death.

I know this little thing
A myriad men will save,
O Death, where is thy sting?
Thy Victory, O Grave?

On the other hand, the hidden truth may be reached only after a long series of patient almost meticulous investigations by a team of experts who approach the problem from various aspects, collating their results as they go along and fitting each new fact ascertained into its proper place like the pieces of a jigsaw puzzle. Of such a nature was the work of the Indian Plague Commission which disclosed in marvellous detail the really amazing story of the transmission and spread of plague from rat to

rat and from rat to man through the mediation of the flea.

These introductory remarks lead me to the conference now meeting in the School of Tropical Medicine.

This conference is one of experts—actual workers on medical research problems drawn from all over India—and also medical officers of health. The conference is held with the approval of the Government of India who invite local Governments and administrations to send representatives, while the chairman, who is the Director-General, Indian Medical Service, also invites certain workers who might otherwise be left out. Although held with the approval of the Government of India, the conference is organized by the Indian Research Fund Association for its main object is to provide an opportunity for technical discussion of the research work carried out under the auspices of this association and for its appraisal with a view to the future programmes of works.

The conference exercises no official authority, the views of its members do not necessarily bind the administrations from which they come, while the recommendations it makes and the resolutions it passes represent nothing more than the majority view of the members composing it. Probably in this very vagueness of its relations and its lack of official authority and responsibility lie its greatest value. Its discussions of research work are frank and highly critical and its recommendations and resolutions unfettered by the restrictions necessarily imposed upon delegates bound by official 'instructions'.

The association of research workers and medical officers of health in the conference is no haphazard one. A research worker necessarily concentrates upon the subject he is investigating which is apt in his outlook to assume enhanced importance. This tendency as well as the stringent financial limitation imposed in these days upon medical research in India renders close association and free discussion with officers who have their fingers on the public health pulse highly desirable. Health officers on the other hand, in proportion as they are out of touch with the progress of medical research, are out of date.

Finally the conference provides, once a year, an opportunity for research workers, engaged upon similar or allied enquiries and health officers faced with identical or analogous problems in widely distant parts of India, to meet and pursue for a few days an intensive exchange and comparison of ideas. The value of this annual mental purge and tonic in a sub-continent like India is almost incalculable, and it accrues, be it not forgotten, not merely or in the main to the individual representative sent but principally to the administration employing him.

Attendance at the conference is no 'joy-ride'. There are no 'social functions' in its programme and hard work is the order of the day: indeed the volume of work is too great to be dealt with in full session, hence much is done by committees. At the present conference there are five such committees, which were constituted at a meeting of the scientific advisory board immediately preceding the conference. They deal with malaria, cholera, plague, leprosy and rabies. These committees may vary from year to year according to the amount of work involved. Thus, next year it may be desirable to form a committee on nutrition and deficiency diseases—a subject whose importance to India is coming to be more fully recognized. The nutrition of the people is of fundamental importance in relation to health problems and is closely connected with economic conditions and questions of population and social progress.

It is impossible in the remaining minutes at my disposal to detail the various researches which are now in progress or under contemplation for next year, but I can give you a rough indication of their scope.

Malaria, the most important disease endemic in India, occupies a prominent place in our programme, and investigations into it are organized under the Malaria Survey of India, financed by the Indian Research Fund Association and based on Kasauli. This Survey does a vast amount of investigation including special research work and local surveys. It holds post-graduate classes in malaria for the training of experts and publishes a journal called *Records of the Malaria Survey of India*. Malaria surveys of Sind in relation to irrigation and of Quetta with special reference to post earthquake conditions have recently been completed and some very valuable work has been accomplished at Karachi in connection with the threatened introduction of yellow fever.

Cholera is a disease whose home is India, and the world looks to us for the solution of its problems. An attack on these problems has been organized and many lines of work are being pursued at Kasauli, here in Bengal and in Assam. Much is hoped for from the teamwork now in progress and results so far are encouraging.

In plague, research is being pursued in Bombay into the preparation of a potent anti-plague serum for treatment, and on improvements in the efficacy of the famous preventive vaccine of Haffkine. An important epidemiological enquiry is also in progress in the Cum-bum Valley of Madras Presidency.

Rabies research includes improvement of the vaccines now in use both for men and animals and a statistical analysis of the results of treatment throughout India.

In leprosy, attempts are being made to cultivate outside the body the causative germ of

the disease, while a study of rat leprosy is in progress. Improved methods of treatment are constantly being sought and tried out.

Outside the scope of the special committees we have many enquiries. Under 'Nutrition' we have in progress a systematic survey of Indian foodstuffs and an enquiry on cheap balanced diets, also investigations into the causation of stone in the bladder and into vitamin deficiency; while field observations have been made with the object of obtaining data, of the standard of physique in relation to diet and the incidence of food deficiency diseases.

Investigations proceed into the action of various drugs, indigenous and others, into drug addiction, into typhus fever, snake venoms, epidemic dropsy, cancer, tuberculosis, anaemia of women, worm diseases, fungus diseases, cirrhosis of the liver, cataract and, I am glad to say, that scourge of India, the contagious eye disease 'trachoma'.

I have said enough to indicate the present scope of our activities; what of our finances? Alas they are far from satisfactory. When the financial crisis occurred a few years ago, the Government of India found it necessary to reduce our annual grant from Rs. 7½ lakhs to Rs. 1½ lakhs. Fortunately a considerable sum has accumulated to the credit of the Indian Research Fund Association during the War and Post War years and by drawing on these savings it has been possible to maintain the level of the research work, but these savings are rapidly dwindling and we can only hope that when they are gone it will again be found possible to augment our grant for research. We have spent this year roughly twice our income and have drawn four lakhs from our accumulated funds.

We are perhaps open to the accusation that we have not cut our coat according to our cloth and had better reduce our expenditure and balance our budget, but Gentlemen! it is no light matter to cut down, by one half, the medical research that is going on in India at the present moment. If there is one thing upon which all the public health experts and research workers attending the present conference are unanimous, and unanimity is hard to find among such persons, it is upon the need for more medical research in India and it would take a bold man and perhaps a foolhardy man to say that the resources of Government and of philanthropists in India are exhausted and that medical research must therefore have its activities drastically curtailed.

I have mentioned philanthropists, for medical research in all countries makes the strongest appeal to those who appreciate, what it has already done, for humanity and who have the imagination to visualize its potentialities for the future. Unfortunately with the exception

of a munificent grant from the Raja of Parlakimedi the Indian Research Fund Association has so far had no financial support from any non-Government source. Nevertheless no worthier object for public support could exist. I could dilate upon this point extensively had I time, but will content myself with one example.

Before the introduction of Jenner's vaccination, smallpox was regarded throughout Europe and the East as a necessary evil which only the fortunate few escaped. Now, owing to that vaccination, it has become 'the perquisite of those who elect to have it'.

Two cautions demand mention before I finish. The greatest discoveries of medical research are still-born unless they are acted upon, and here in India there is a tendency for the application of our knowledge to lag behind its attainment. Thus we still get extensive epidemics of the so easily preventable disease smallpox, while in too many of our cities we continue to permit the creation of slums providing just those conditions which investigation has shown to facilitate the spread of tuberculosis of the lungs.

Sixty-five years ago the crying need was for knowledge of the mode of spread of our main diseases such as malaria and plague. To-day we still have a vast amount to learn, but perhaps our greater problem is the successful application of the theoretical knowledge we already possess, and this in itself requires much patient investigation, largely in the field.

The other point I would make is that there is no short cut to health which avoids the costly road of environmental hygiene. If we are to have a healthy people we must face the cost of pure and sufficient water, good drainage and refuse disposal, wholesome unadulterated foods and healthy houses with avoidance of overcrowding. These are essentials which no stunt sanitation can replace and no amount of research can ever enable us to dispense with.

Gentlemen, I do not think it is an exaggeration to say that were it not for medical research less than half of us would be present here to-day. I have been told that formerly European residents of Calcutta used to meet annually to congratulate themselves on having survived another year, and there is no reason to believe that among other sections of the community health conditions were any better. To-day it is possible to obtain a life insurance policy without any additional premium for residence in India.

This is however not the end but the beginning; many diseases still flourish that should be prevented, many others lie in wait for the time when we shall be off our guard. Medical research must always be required, as the intelligence department of an army, constantly mobilized against what Paul Zinsser has called 'these ferocious little fellow creatures which lurk in the dark corners and stalk us in the bodies of

rats, mice and all kinds of domestic animals; which fly and crawl with the insects and way-

lay us in our food and drink and even in our love'.

Medical News

SALVARSAN SILVER JUBILEE

ON 10th December, 1935, a special meeting was held in the auditorium of the All-India Institute of Hygiene and Public Health to celebrate the twenty-fifth anniversary of the first introduction of salvarsan into therapeutics.

The room was well filled and the gathering was a representative one. Dr. A. C. Brocke, D.Sc., opened the proceedings in the following words:—

Ladies and Gentlemen,

On behalf of the Scientific Department of Bayer-Meister Lucius, the organizers of this meeting at which this distinguished gathering of medical men and scientists have come together to celebrate the silver jubilee of the discovery of salvarsan and to do honour to its inventor Paul Ehrlich, I have the great honour to welcome you here to-day.

We have been particularly fortunate in having as our speakers to-day such distinguished scientists as Brevet-Colonel R. N. Chopra, C.I.E., K.H.P., M.A., M.D., M.R.C.P., I.M.S., and Lieutenant-Colonel K. K. Chatterji, F.R.C.S.I., I.T.F. It would be incongruous if I were to introduce either of these speakers as both are already so well known to you all and their research work has gained them a reputation not only in this country but in the medical world at large. I feel that this is a good opportunity for thanking, on behalf of the medical and chemical research workers of our scientific department of which I am the humble representative in Calcutta, not only the two speakers but the many other workers in Calcutta for their co-operation with us in the search for new drugs to use in our fight against disease. The laboratories in Elberfeld and Frankfurt can work out and prepare drugs and test them on animals just as Ehrlich did 25 years ago, but they are dependent on those workers in the field with a scientific outlook to give the necessary clinical trials under carefully-controlled conditions before they can issue them for use to the general medical profession.

The disease which Paul Ehrlich was fighting is an universal one and therefore he could carry out the initial trials in our own country. However to continue his research it was necessary to look to workers in this country for guidance in certain aspects, such as in the suitable dosage to be recommended to doctors whose patients are mainly Indians who will not stand the full doses recommended for Europeans, and in such matters as the keeping properties of arsenicals in the Indian climate, but for a number of other drugs we are dependent almost entirely on the research work and clinical trials by workers in this and other tropical countries. It has been the tradition in our laboratories to work in the closest collaboration with scientists in this country and all over the world. We hope the Department 'Bayer' has been of some assistance to you, but I can assure you that your co-operation has been invaluable to us and on behalf of the research workers in our laboratories at Home and my colleagues here, I once more want to express our sincerest thanks for your active help in furthering the science of chemotherapy, the foundations of which were laid by that great man in whose honour we are gathered here to-day.

Lieutenant-Colonel Chatterji proposed that Colonel Chopra should be chairman of the meeting, and took the opportunity of congratulating him on the recent honours conferred on him—his admission as a member of the Royal College of Physicians of London, and his appointment as King's Honorary Physician.

Colonel Chopra took the chair and after thanking Lieutenant-Colonel Chatterji and all those present, he delivered an address on Paul Ehrlich and his work, as follows:—

The preparation and application of organic arsenicals in medicine, for which Paul Ehrlich was primarily responsible, were doubtless the result of a long and persistent search for substances which have specific action against disease. The advent of these compounds into the realm of medicine marked a new era in the history of rational development of therapeutics and the modern science of chemotherapy. At once, it opened up a new vista, pregnant with infinite possibilities, towards the one goal of medical science, viz, the amelioration of human suffering. Not only was this a definite step forward in the path of medical research, but it was a new departure, indeed a new acquisition to the armamentarium in our struggle against disease. The diseases which exacted a heavy toll of human lives, that ravaged towns and villages, and told adversely upon the culture and civilization of bygone ages, and which were in consequence looked upon as visitations from Heaven, due to sins of man, are no longer looked upon with awe and dismay, but with the spirit of triumph and victory on account of this work. These monumental contributions of Ehrlich rightly deserve a foremost place in the history of the fight of man against disease.

Paul Ehrlich was born in March 1854 in Silesia in Germany where the art of dyeing flourished as an old handicraft. He was, therefore, familiar from his boyhood with dyes and a story is told that when attending the microscopical courses as a young student in Strasburg, his teacher Professor Waldayer found, to his surprise, Ehrlich's place in the laboratory covered by a patchwork of stains of many colours, and asked him what he was doing. The answer was 'I am staining', whereon the teacher could only reply 'Well go on by all means'.

In his early life as a medical student Ehrlich was very much impressed with Heubel's work on lead poisoning. This work probably first gave him the basis for the idea that chemical agents have great influence upon living bodies in general and that 'the ways and means by which the drugs are distributed in the body must be of greatest importance' in therapeutics. This idea combined with the knowledge that in technical processes certain dyes were fixed by certain fibres gave a strong impulse to his research work in later years and led him into a series of studies upon the selective effect of various synthetic dyes on the blood and tissue cells. The results of such studies no doubt further led him to the conclusion that chemical substances might be produced which would unite with and destroy parasitic agents of disease without in any way injuring the cells of the host. It is this study of the selective affinity of chemical agents for parasites that led him to pronounce his famous theory '*Corpora non agunt nisi fixata*' which means 'bodies do not act unless fixed'—a theory that still lies at the basis of modern chemotherapy.

The development of the science of immunology with its discovery of natural and acquired antibodies, specially the discovery of the protective and curative action of the diphtheria antitoxin, strengthened Ehrlich's hope of finding out chemical agents capable of destroying parasites causing disease. Regarding the antibodies his idea was that 'they had no affinity at

all for substances of the body, but they rush exclusively at the parasites. Therefore in this case organotropy is reduced to zero, parasitotropy is absolute and the antibodies represent magic bullets which seek their unerring aim'.

Researches with dyes.—In 1887 acetanilide (antifebrin) and certain other substances were synthesized from coal tar and the use of these substances in medicine as antipyretics and analgesics still further stimulated him. Ehrlich began his work with the application of synthetic dyes to those bacterial infections that could be produced in laboratory animals like mice, guinea-pigs, rabbits, etc.; the line of study being the investigation into the manner in which immunity to such diseases could be increased in mice. Unfortunately his work with bacteria met with little success. He had, however, an infinite reservoir of patience and after a lengthy period of failures, which lasted till 1901, he at last came across Laveran's work on the production of trypanosomiasis experimentally in mice and rats. From that time onward Ehrlich and his co-worker Shiga directed their attention towards the trypanosome infection in laboratory animals. These parasites were then known to be responsible for causing sleeping sickness in the natives of Africa and to produce a disease in horses known as *mal de Caderas*. The incidence of death due to infection with these parasites in mice was one hundred per cent. Ehrlich and Shiga tried a large number of synthetic dyes on such infected animals, but the results were uniformly unsuccessful till at last they hit upon a dye known as *benzo-purpurin*. This dye was however without any effect, but by the introduction of a 'sulpho-group' into this they were able to synthesize a new compound that gave hopeful results in a few cases. This 'changed' dye was termed trypan red, but it was later found that the failures with it were perhaps more numerous than the successes, and that the efficacy of the drug was therefore doubtful.

But the perseverance and zeal of Ehrlich were unbounded. Success and failure were looked upon by him equally with enthusiasm so long as they were instrumental in gaining experience. In the words of Tennyson, to him 'all experience is an arch wherethro' gleamed that untravell'd world' and failures in particular instead of throwing him into despair goaded him all the more 'to follow knowledge like a sinking star beyond the utmost bound of human thought'.

Preparation of organic arsenicals.—Ehrlich's next line of attack consisted in the study of various pentavalent organic arsenicals on trypanosomes *in vitro* and he found that these compounds were all inert. In 1905, however, Thomas published the results of experiments showing that atoxyl had a curative action on laboratory animals infected with trypanosomes. Koch about the same time obtained encouraging results in the mass treatment of sleeping sickness with atoxyl among the natives of Africa. He found that, although atoxyl was not a certain cure for this disease, it often produced considerable improvement. The number of failures could not, however, be overlooked. Besides this the untoward effects produced by this drug, particularly the loss of sight among those who received treatment with it, were of serious significance. Contrary to the findings of its discoverer, Beauchamp, atoxyl was found to be 'para-amino-phenyl arsenic acid' containing pentavalent arsenic within it, and the activity of this compound, although it contained pentavalent arsenic, was regarded by Ehrlich as being due to the reduction of arsenic to the trivalent state within the body. With this theory as his basis, he started work on the study of trivalent organic arsenical compounds. Ehrlich's first attempt was to 'change' pentavalent arsenic in atoxyl to the trivalent form. This led to the preparation of many compounds and the search for suitable compounds went on incessantly in Ehrlich's laboratory. He himself and his assistants prepared one compound after another with atoxyl as the starting point and tested each compound on animals infected with trypanosomes. In this way this laborious process of preparation and testing continued and over 600 different

compounds were duly examined. Most of these were found to be ineffective, only one or two among them giving promising results. It was observed that although some of these compounds could cure trypanosomiasis, they unfortunately produced in some animals fatal hæmolytic, jaundice and other toxic effects. In the case of one drug it was found that it killed the parasites, but it damaged the nervous system of the animals to such an extent that the animals used to dance 'not for a minute or an hour due to their liberation from the clutches of the dreadful disease but for the rest of their lives'. After studies extending over many years with derivatives of atoxyl a compound, para-arseno-phenyl-glycine, was produced in which two arsenic atoms were linked by a double bond and each coupled to the benzene nucleus by a single linkage. This compound was in fact the precursor of the arseno-benzene compounds which were later found by him to be very effective. At last after a prolonged search he was in 1910 rewarded by the production of the 606th compound which was 'dihydroxy-diamino-arsenobenzol-dihydrochloride'. This compound had a most potent effect on the trypanosome in infected animals without at the same time injuring the host and the news of the great discovery soon spread throughout the scientific world.

Action of arsenicals on spirochaetes.—In the meantime the organism responsible for producing syphilis had been discovered by Schaudinn in 1906, who named it '*spirochaeta pallida*' and brought out the fact that it was closely related to trypanosomes. Indeed he went so far as to say that 'spirochaetes may sometimes turn into trypanosomes'. When Ehrlich came across this work the importance of the destructive action of his arsenical preparations on trypanosomes and their chemotherapeutic possibilities became apparent to him and he was led to announce '*Quod non sanat ferrum sanat arsenicus; quod non sanat arsenicus sanat ignis*' which means 'what iron does not cure arsenic cures; what arsenic does not cure fire cures'. Ehrlich's work received a fresh impulse when Paul Uhlenhuth in 1907 demonstrated the striking effect of atoxyl in fowl spirochaetosis, an action which was confirmed in collaboration with E. Hoffmann in experimental syphilis in monkeys. This strong conviction of his on the efficacy of arsenical preparations has, to a very great extent, come true as recent researches clearly point out. It was therefore very natural for him to try his compound no. 606 in this disease also. He justified this attempt of his by saying 'If the pale spirochaete is a cousin of the trypanosome of the *mal de Caderas* then 606 ought to hit that spirochaete.... What kills trypanosomes should kill their cousins'. In this way Ehrlich and his co-worker Hata first tried this drug on a rabbit infected with spirochaetes and that rabbit was the first living being completely cured of the disease. This, however, is the short history of a long research requiring years of patience, and perseverance amidst failures and anxieties and culminating in the discovery of 'Ehrlich 606'.

It will be seen, therefore, that the drug 'Ehrlich 606' was primarily discovered to fight trypanosomes and it was later found to be useful in the treatment of syphilis. The action of this compound against two of the most dreadful diseases impressed the scientific world and the drug was examined by both chemists and pharmacologists alike who confirmed Ehrlich's claims. This compound is said to have a dibenzol or arsenobenzene nucleus coupled together by two trivalent atoms of arsenic. The nucleus itself is of no therapeutic value and is of interest only because it is the parent substance of salvarsan. By a multiplicity of changes, syntheses and experiments attempts were made to determine which atoms or groups of atoms and what grouping in the molecule increased its affinity for the parasites and reduced its toxicity to the cells of the host. It was found that substitutions in the NH₂ group may cause profound differences in the effect of the compounds, sometimes an increase and sometimes a decrease in the therapeutic effect.

Preparation of neosalvarsan.—On the 20th of September 1910 when Ehrlich's discovery was officially made known to the world, his friend Neisser remarked that naturally the first discovery cannot be expected to be perfect in every respect, but that it was hoped that the preparation 606 would be followed by a still better preparation 607 or 608. Neisser, however, was too optimistic when he expected that the next two preparations were going to solve the question. Years of further patient and laborious work were required until the preparation 914 or neosalvarsan (which is a condensation product of salvarsan and sodium formaldehyde sulfo-oxylate) was discovered. This compound is sodium 3:3 diamino-4:4 dihydroxy-arsenobenzene-methylene-sulphinate and it is derived by the introduction of the methylene sulphinic group into one of the two amino-groups. This new compound satisfied many of the requirements demanded from such drugs, viz, decreased toxicity, and has a neutral reaction. The fact that it is nearly 2.5 times less toxic than salvarsan and the ease in manipulation has increased its popularity although its keeping powers are not so great; its solution oxidizes readily on shaking and its toxicity, and therapeutic efficiency are also apt to vary in different samples (Dale and White). In fact, its precise structural composition is still uncertain; Ehrlich merely described it by stating that it was obtained from arsephenamine by the action of formaldehyde sulfo-oxylate. Nevertheless it was a distinct improvement on the former compound and is at present being used extensively by medical men throughout the world. Attempts have been made and are still being made to find out a stable variety of this compound that will prove to be even more satisfactory from a therapeutic point of view and less toxic. Of all these the silver sodium compound of salvarsan or neosalvarsan has a high chemotherapeutic index but therapeutically it is no more effective. All other compounds of this nature that have been obtained up to now have however no special advantage over neosalvarsan.

Arsenical preparations in therapeutics.—The far-reaching effects of Ehrlich's work cannot be overestimated. Although admittedly the *therapia magna sterilisans* that was expected to follow on the heels of 606 has not matured, the development of the science of chemotherapy, of which salvarsan was the first striking success, has placed within the reach of the physician many potent remedies against disease. To the physician in the tropics, Ehrlich's researches have directly or indirectly given many specifics for diseases, such as kala-azar, trypanosomiasis, syphilis, yaws, etc., which were considered incurable. Other diseases such as rat-bite fever and relapsing fever which produced much incapacity can now be cured with a few injections of arsenobenzene compounds.

Ehrlich's work on the organic arsenicals has been carried further by other workers. Not only were further possibilities of the trivalent compounds explored, but a comprehensive study of the pentavalent compounds was pursued with gratifying results. In this way another compound, tryparsamide (sodium-n-phenyl-glycinamide-p-arsenate), was discovered at the Rockefeller Institute, New York, which is useful in the later stages of trypanosomiasis and syphilis when the parasites have penetrated into the central nervous system. Fournneau and his colleagues at the Pasteur Institute, Paris, produced a series of compounds of which Fournneau 270 (sodium-4 acetyl amino-2-hydroxyl-phenyl-arsenate) and Stovarsol (sodium-3-acetyl-amino-4-oxyphenyl-arsenate) are well known. These compounds are of particular interest since not only did they throw light on the relationship between chemical constitution and parasitic action, but led to the production of certain compounds which are effective when administered by the oral route. Although these particular compounds had a limited degree of success in curing syphilis and trypanosomiasis, they opened up for the physician fresh possibilities in oral therapy. The result has been rediscovery of the compound carbarsone (4-carbamino phenyl arsonic acid) which

was originally prepared by Ehrlich and which was discarded by him because it did not have any marked trypanocidal properties. This compound in doses of 0.025 gm. twice daily for 10 to 15 days cures a large percentage of cases of chronic amœbiasis which were not touched by emetine and its derivatives. The introduction of carbarsone into tropical therapeutics marks a definite advance in the treatment of this widespread disease.

Ehrlich's basic work on dyes, although it gave him disappointing results, has been responsible for the production of such powerful drugs as Bayer 205 which has proved effective in the treatment and prophylaxis of trypanosomiasis and Yatreñ 500 which is an effective remedy against amœbic and bacillary dysentery. The preparation of powerful antimalarial remedies such as plasmochin and atebrian by Professor Schulemann of Bayer-Meister Lucius and his co-workers, which has changed our whole outlook of this world-wide disease, followed indirectly upon Ehrlich's work.

The series of organic compounds of antimony we also owe to his researches, because it was working on the lines of Ehrlich's work with the preparation of organic arsenicals that Professor Schmidt, at that time working with Von Haydon's firm, produced the antimonial compounds which led eventually to the preparation of urea-stibamine and neostibosan which are effective against leishmaniasis, and antimosan and foudain which are effective against the dreaded schistosomiasis.

Organic arsenicals themselves have been tried in the treatment of widely different diseases and, although they have not produced uniformly successful results, further studies may lead to the production of compounds having a specific action against disease. For instance experiments on bacterial infections show that arsephenamine compounds when injected into animals confer upon the blood bactericidal properties that are retained therein for a considerable time. The serum of patients after injection of arsenicals exerts a bactericidal effect upon staphylococci and hæmolytic streptococci. Further work in this connection may lead to interesting and important developments. In helminthic diseases although the arsenicals do not produce uniformly successful results, a few intravenous injections may often give relief against trichinosis and filarial infections.

Such is a brief account of Ehrlich's researches and their achievements in the domain of medical science. It will not be too much to say that so far as protozoal diseases are concerned the effects have been remarkable and further progress is expected. Hosts of workers are following in Ehrlich's footsteps and chemotherapeutic research is making rapid strides. The discovery of salvarsan is not only a pioneer work but a distinct landmark in rational development of therapeutics. The preparation of this single compound has given chemotherapy a solid foundation on which it now stands. It has supplied the practitioner with missiles with which he can wage war against parasites which produce disease and suffering in man and animals. It has raised chemistry at once from being a science necessary for human comfort to one that can save mankind from its microscopic enemies.

Lieutenant-Colonel Chatterji then addressed the meeting:—In my student days I used to hear of Paul Ehrlich, of him as a man and his wonderful contributions to the science of medicine. Reading about a person is one thing but seeing him is something very different and I have always been addicted to indulge in the curiosity of seeing the person I had read about, and I wondered then whether I would ever be able to meet this great man. For once, luck was in my favour, and I found it possible to go abroad to see things and to learn what I could from seeing. In 1908, I found myself in the august presence of Paul Ehrlich. It was at a meeting of medical men and Ehrlich turned up there most unexpectedly; let me be frank and admit that his advent was an inspiration to me. A little man, rather thin with a genial face and even more genial

smile; there was an air of sadness in his features which may be explained by the virulent criticisms levelled against him by other scientists. His eyes were remarkable; they were bright with an intensity of life which seemed to glow from them. I think he told me that he never despaired and that no one should ever despair. Like an expectant mother he was looking forward to a successful issue of his investigations. With Brahmanical instinct I wished for blessings for his success. That success came, success always comes to the deserving, like Paul Ehrlich. A weary traveller, he travelled the paths of research, working and achieving and giving the results of his achievements away for the advancement of science; such gifts are like milestones of silent mementoes of his scientific work which led to amelioration of human suffering.

This day, 25 years ago, Paul Ehrlich addressed a meeting of scientists and members of the medical profession at Frankfurt and made the momentous announcement that '606' had achieved what he had hoped it would achieve. He christened it 'salvarsan' and rightly so. It is truly salvation (sanskrit equivalent, *paritran*) because it not only meant salvation of the individual sufferer, but it has brought salvation to nations all over the world from the ravages of a disease which cripples, maims, incapacitates and invalidates through the destructive propensities of its causal parasite, pretty to look at, delicate in its movements but endowed with powers of invasion of every structure of the human host. More than that, it can lie fast and latent in the most intricate parts of the human body and has the unique capacity of transmitting itself from one human generation to another. This familial transmission seems to be its birthright and environmental protection its latent safeguard. From time immemorial weapons have been devised for the destruction of *Treponema pallidum* but it was left to Ehrlich to find in '606' the most formidable among them, thanks to his genius, undaunted courage and perseverance.

Paul Ehrlich was instinctively an investigator, originator of ideas and a philosopher; a man of great imagination, imagination which was creative and productive. There is no finality in research and Ehrlich knew that. I believe he was contemplating a voyage East and West, to the tropical regions to make a further study of the disease for the cure of which he had discovered '606', but the cruel war interposed and his work was interrupted. He might have got some information from his understudy, Hata, and from the Hamburg Institute of Tropical Hygiene. How I wish he had come to India, because the more I see, the more I appreciate the vagaries in the manifestations of the disease tainted with tropical infections and during my last sojourn to the West I wandered about in search of facts in relation to this disease influenced by tropical conditions. I collected some and presented them to research departments here for investigation and study. But this, the most killing of diseases rendered even more killing by tropical infections, did not seem to be included in the departmental nomenclature of diseases. There seems to be an apathy towards this and sooner it is shaken off the better it is, for this and other tropical and subtropical countries. It would be difficult to find a Paul Ehrlich again, but lesser Ehrlichs may be found who could pick up the thread where he left it and work for the solution of this great problem.

This is neither the place nor the time for entering into the posology and therapeutics of '606', but I shall just tell you a few things that trouble me. The manifestations of this disease are most varied. It is a great mimic and to be misled is not difficult. Then the toxicity of the drug in some cases and its inaccessibility to the parasite in arsenic-resistant cases are further puzzles. Familial and third generation transmissions, their vague, indefinite and uncertain manifestations are difficult problems. Ehrlich has brought salvarsan as a rare gift to the medical profession; it is a good and powerful weapon, but let us not forget that in fighting a formidable and subtle enemy like the treponema,

while '606' may make the frontal attack, we have other weapons like mercury, bismuth and iodine for rear and flank attacks and the much condemned air bombing. We may use these simultaneously or alternatively as surprise attacks. The eradication of the infection is indeed a difficult problem. Ehrlich is not here to make further gifts to solve these problems, but whoever does will bring *paritran* to our land.

Gentlemen, in treating a patient to cure him of this disease, begin in the beginning and go on till you think you have come to the end of treatment but do not stop lest you may have to begin over again.

Dr. Brocke then spoke again:—

The addresses of two so distinguished workers have given us very vivid impressions on the great scientist's career and I feel that this is the occasion to present to the speakers two replicas of the memorial tablet erected in Paul Ehrlich's study in the Georg Speyer-Haus and State Institute for Experimental Therapy in Frankfurt. I feel greatly honoured that I am allowed to do so and that I am to convey the sincerest greetings of the research workers of Bayer at Home whose names—like Dr. Schulemann, Dr. Hoerlein and Dr. H. Schmidt—are not entirely unknown to you.

The memorial tablet in Paul Ehrlich's study bears the Latin inscription *CHEMOTHERAPEUTICS POSTULATUM PRIMUM UT PROFICIATUR. PRIMO PROXIMUM UT NIL NOCEATUR* (For a chemotherapeutic it is the first postulate that it should cure but the very next one that it should not do any harm), a principle which has always been and we hope will be the guide of research work all over the world as a living heritage of Ehrlich's work.

He presented the two medallions.

A very excellent cinematograph 'talking' film describing and illustrating the history, the symptomatology, and the treatment and cure of syphilis was shown.

Colonel Chopra then closed the meeting by thanking Dr. Brocke and the scientific department of Bayers for organizing the meeting and for the replica medallions that he had presented to Lieutenant-Colonel Chatterji and himself.

EXTRACTS FROM THE MINUTES OF THE BENGAL COUNCIL OF MEDICAL REGISTRATION HELD ON THE 18TH FEBRUARY, 1935*

1. THE remarks offered by the authorities of the undermentioned medical schools on the Inspection Committee's observations recorded on inspection were referred to the Committee for consideration:—

- (i) Ronaldshay Medical School, Burdwan.
- (ii) National Medical Institute, Calcutta.
- (iii) Bankura Sammilani Medical School, Bankura.

2. It was reported that nomination papers were issued to the members of the Council for the election of a representative of the Council on the Bengal Nursing Council and as a single candidate Dr. Bidhan Chandra Ray, M.D., M.R.C.P., F.R.C.S., was nominated for this election he was reported as elected. The action taken by the office was approved.

3. Government resolution announcing the appointment on the Bengal Sanitary Board of Dr. Taraknath Majumdar, L.M.S., D.T.M., D.P.H., F.C.S., and Dr. Abdul Majed, M.B., D.T.M., D.P.H., representatives of the Bengal Council of Medical Registration and the State Medical Faculty of Bengal, was recorded.

4. Report on the inspection of the Campbell Medical School was adopted.

5. Report on the inspection of the Jackson Medical School, Jalpaiguri, was considered and adopted and it was decided that the authorities of the school should be asked to stop admissions and that the question of its disaffiliation be considered by the Council at their

* Forwarded for publication under letter dated 15th November, 1935.

next meeting and that Government be informed of the decision taken.

6. Government letter authorizing the entry of the title 'Fellow of the State Medical Faculty' in the Register of Registered Practitioners as an additional qualification was recorded.

7. The consideration of the report on the revision of the appendix to the Annual Medical List was postponed.

8. Government notification announcing the acceptance of the recommendation of the Council that the M.B., B.S. degree granted by the Andhra University be recognized as registrable under section 18 of the Bengal Medical Act, 1914, was recorded.

9. It was decided that the qualification D.B. (London) be entered as an additional qualification against the name of Dr. Ganapati Panja, M.B., in the Register of Registered Practitioners.

10. The consideration of the application of Dr. M. R. Treu, M.D. (Cologne University), for registration of his name under the Bengal Medical Act, 1914, was postponed for the next meeting.

11. Government notification announcing the election of Dr. Bidhan Chandra Ray, M.D., M.R.C.P., F.R.C.S., under clause (c) of section 4 of the Bengal Medical Act, 1914, was recorded.

12. On an application from the Registrar, Andhra University, it was decided that a report be made to the local Government under section 18 of the Bengal Medical Act, 1914, recommending that the L.M.S. diploma granted by the University be recognized as registrable in Bengal.

13. On an application from the Registrar, University of Rangoon, it was decided that a report be made to the local Government under section 18 of the Bengal Medical Act, 1914, recommending that the L.M.S. diploma granted by the University be recognized as registrable in Bengal.

14. An application from the Principal, Ludhiana Medical School, praying for recognition of the school as an institution eligible to train and send up candidates for the Licentiate Examinations of the State Medical Faculty of Bengal up to the Intermediate standard was refused as there was already a Medical Faculty in the Punjab.

15. It was decided that the Dacca Medical School and the Lytton Medical School, Mymensingh, should be critically inspected during the next 6 months.

16. The consideration of the returns submitted by the recognized medical schools was postponed for the next meeting.

17. With regard to the publication of the Annual Medical List it was decided that it should henceforth be corrected up to the date it goes to press.

18. With regard to an application from the authorities of the *Medical Bulletin*, Bombay, it was decided that copies of such proceedings and resolutions as are intended for the medical press may be supplied for publication in the *Bulletin*.

19. The undermentioned gentlemen were re-appointed members of the Penal and Ethical Cases Committee for the year 1935:—

Lieutenant-Colonel T. C. Boyd, D.P.H., F.R.C.S., I.M.S.

Dr. J. N. Moitra, M.B.

Sir K. N. Das, Kt., C.I.E., M.D., F.C.O.G.

Dr. P. Chatterjee, M.B., F.R.C.S.

Dr. A. D. Mukherjee, L.M.F.

20. Considered two reports of the Penal and Ethical Cases Committee.

21. Dr. J. C. Chatterjee, L.M.S., was re-appointed a member of the Managing Committee of the Provident Fund of the Office.

22. Dr. K. S. Ray, M.A., B.Sc., M.B., Ch.B., was appointed a member of the Inspection Committee *vice* Dr. Mrigendralal Mitra, M.D., F.R.C.S., deceased.

23. With regard to an application from Mrs. Kusumkumari Majumdar, L.M.P., L.M., praying that her M.D. (Berne) qualification be entered against her name in the Register of Registered Practitioners as an additional qualification it was decided that particulars

regarding this degree should be obtained from the University.

24. Entry under section 21 of the Bengal Medical Act, 1914, of the qualification D.T.M. & H. (England) against the name of Dr. Francis John Copeland, M.B., Ch.B., was approved.

25. The raising of the fee for registration of an additional qualification from Rs. 5 to Rs. 25 and the price of the Annual Medical List from Rs. 3 to Rs. 5 per copy was agreed upon.

26. The following motion of Dr. Amulyadhan Mukherjee, L.M.F., was referred to the Inspection Committee:—

'This Council is definitely of opinion that in institutions recognized by this Council each subject excepting Medical Jurisprudence and Hygiene must be taught by separate teachers as is done in the Medical Institutions of Calcutta and Dacca'.

TROPICAL DISEASES BULLETIN

Tropical Diseases Bulletin. Vol. 32. Supplement. Nov., 1935. 280 pp. 'Medical and Sanitary Reports from British Colonies, Protectorates and Dependencies for the Year 1933' summarized by H. Harold Scott, M.D., F.R.C.P., D.P.H., etc., Director of the Bureau of Hygiene and Tropical Diseases. [Price 7/6.]

This fifth annual issue of the 'Medical and Sanitary Reports from British Colonies, Protectorates and Dependencies for 1933' contains an account of the activities of 55 medical services within the British Colonial Empire. The reports record the progress made in health work during the year in the face of the difficulties of controlling disease among backward populations under unfavourable economic conditions. The main lesson that comes out of a study of the summaries is that in the tropics, as at Home, real improvement in health among the population is bound up with improvement in agriculture, housing, and education and the raising of the general standard of living, and to bring this about wise and informed administration at the head and harmonious co-operation between the different government departments are essential. The medical departments are shown by their reports to be making their contribution towards the general economic advancement of the native communities in the British colonies by providing medical facilities for curing disease, by prosecuting research into the causes of disease and methods of diagnosis and prevention, by developing health services such as maternity and child-welfare work, school hygiene, and general sanitation, and by arranging for the training of natives as dispensary assistants, sanitary inspectors, nurses, and midwives and in some colonies as doctors, to take their proper share in caring for the health of their own people.

The usual table of vital statistics for British Colonies, Protectorates and Dependencies during 1933 which is appended brings out the lack of reliable data from many parts of the Colonial Empire and the need for a much improved system for the collection of vital statistics in certain British colonies.

INDIAN MEDICAL COUNCIL

In pursuance of the proviso to sub-section (2) of the Indian Medical Council Act, 1933 (XXVII of 1933), the Governor-General in Council is pleased to nominate Major-General Sir Frank Powell Connor, Kt., D.S.O., F.R.C.S., D.T.M. & H. (Eng.), L.R.C.P. (Lond.), K.H.S., I.M.S., Officiating Director-General, Indian Medical Service, as the President of the Medical Council of India, with effect from the afternoon of the 29th October, 1935, *vice* Major-General C. A. Sprawson resigned.

Colonel H. C. Buckley, M.D., F.R.C.S. (Edin.), I.M.S., Inspector-General of Civil Hospitals, United Provinces, has been nominated by the Government of the United Provinces under clause (a) of sub-section (1) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), as a member of the Medical Council of India *vice* Lieutenant-Colonel H. Stott, I.M.S., resigned.

Current Topics

On Some Aspects of Contraception for Indian Women

By MARIE C. STOPES, D.Sc., Ph.D., F.L.S., etc.

(From *Marriage Hygiene*, November 1934, Vol. I, p. 143)

THERE are many good reasons why Indian women should want to know about methods by which they can safely control conception. The reasons are the same as for the women in England and elsewhere. It is not a class matter but a physiological need. However rich a woman may be, her own strength cannot stand rapidly repeated pregnancies without some result of loss in vitality, and hence suffering for the child. Anyone requiring to be argued with about the need for contraception should read my simple, persuasive little book *Wise Parenthood*, or the more detailed book *Contraception, Its Theory, History and Practice*. The methods described in these books are universally applicable, but India has some special problems and in this article I propose to mention one or two points specially for Indian women. The great heat, the distance from supplies, and the extreme poverty of large numbers of the Indian population have to be considered.

Wealthy women are a comparatively small number. It is the poor women of India, the vast majority, for whom special methods must be devised. These cannot be fitted; they cannot afford the price of a rubber cap; probably they could not be relied upon to place it accurately each time. Even the simple sponge and oil method described in my book *Birth Control To-day* is too expensive and the sponge is unobtainable. I have, therefore, thought out a special substitute adapted for the poorest Indian women. This method has the advantage that it costs nothing at all. She does not need to go to any special shop or person to buy anything for she can make what she requires herself in her own home from the things she has in the home. Though the method is so simple it is really a very good and reliable one if used carefully.

The woman should take a small handful of cotton waste. This is not to be confused with what the Europeans call 'cotton-wool'. Cotton-wool is white, prepared, comparatively expensive and loses all its springiness when it is wetted. Cotton waste from her own spinning is springy and soaks up the oil without becoming sodden and flat. It is there without expense. The woman should take enough of the cotton waste and make it into a little pad the size of the palm of her own hand and about the thickness of the end of her own thumb. The waste can be held together by lightly winding threads criss-cross like a spider's web so the tufts do not fall apart; or if clever she can crochet a little net for herself into which the pad can be fitted. Then into a cup or small bowl she should pour a little of her ordinary cooking oil. This oil must be a bland one, not mustard oil, but any bland cooking oil she is using. The pad soaks it up and then she should lightly squeeze the pad to drain off the extra oil so it does not drip. This is then inserted high up in the vagina just before she goes to bed. It should be pinched somewhat together until it is up and then should spread out and tuck round the neck of the womb at the end of the vagina. The pad and the oil together form a barrier past which the fertilizing spermatozoa will not be able to enter. It is best to insert this before going to bed so as not to disturb the romantic feeling and peace which sex union should engender. It should remain there in place until the next morning when it can be taken out while dressing and burnt. If the waste has been enclosed merely in loose threads then the whole thing can be burnt, but

if the pad of cotton waste has been enclosed in a specially made net, then the net may be preserved and washed, but if so it ought to be boiled to be really clean. It is probably better to hold the pad together with lightly bound threads and burn the whole thing.

The woman must realize she must not remove this pad immediately after the act of union has taken place, for the grease must be allowed thoroughly to deal with the spermatozoa. If removed too soon it would give them an opportunity of swimming in, but if left until the next morning it is almost certain all the spermatozoa would be rendered useless by that time.

There will probably be a good deal of opposition to the spread of knowledge of a method so simple and inexpensive, for unfortunately contraception affords a source of profiteering wealth to many commercial interests. But I trust that this message to poor Indian women may reach them and save them from needless fear of undesired pregnancy and from a needless dependence on commercial interest.

For the well-to-do Indian woman, educated, and with sufficient money to spend on hygienic requirements, some scientific and precise method may be better suited. There are various types of rubber barriers or caps, for example the 'Racial' occlusive or the 'Clinocap', Dutch diaphragm, or other makes which should be selected according to her internal conformation. Anyone of these, if she can get instruction in its proper fitting, is quite suitable. The difficulty of getting the proper instruction, however, bars the cap from use by many women who would otherwise like to, and can quite well afford to pay the couple of shillings that it costs. But it is inadvisable to use it without proper instruction. Some women who have had instruction in the use of the cap and wish to carry on with the cap that suits them, and use greasy suppositories with it, and who wish to continue to get supplies from England, find that the greasy suppositories melt in transit. There are many commercial firms who, knowing this, sell greasy suppositories 'specially made for the tropics'. These may arrive in good condition and the woman may not know enough to realize that the very fact that the grease was hard enough not to melt in transit shows it is unsuitable for the purpose, for the internal temperature of a woman does not depend on external temperature, and a woman in the tropics needs just as low melting-point grease as she does in a cold climate. To overcome this great problem I have been looking into the matter of internal temperatures and melting-points of odourless grease and we have now at our clinic specially coated low melting-point grease, the coating of which also melts internally after having been dipped in cold water. These, called the 'Clinocap' solubles, are specially adapted for use in the tropics and a wealthy woman who wants to go on using the technique she has been taught in Europe can easily do so if she uses these 'Clinocap' tropical solubles which she can get from my clinic direct.

It is greatly to be desired that a service of properly trained Indian medical men and women and qualified midwives should receive technical instruction not only in the art of choosing the right contraceptive and fitting it for each patient, but also in the art of teaching patients how to apply the method themselves. For contraception differs from other medical matters in depending much more on the patient than do most medical measures. The woman using any contraceptive must use it accurately every time and must be taught the importance of care.

Technical instruction in contraceptive technique with demonstrations and practice on living models were initiated by me at the Society for Constructive Birth Control Headquarters in London, 106 and 108, Whitfield Street. If any wealthy Indian wants to serve his or her country I suggest that an endowment sufficient to send out a C.B.C. trained nurse and doctor to institute centres of instruction in India would be the greatest boon. Our society is ready with technique and staff; money only is needed to provide this service for which Indian motherhood is crying out.

The Care of European Children in the Tropics

By H. S. STANNUS, M.D., Ph.D., F.R.C.P., D.T.M. & H.
(From the *Practitioner*, Vol. CXXXV, August 1935,
p. 138)

It is not perhaps always realized by those who dwell in temperate zones how extreme may be the variations in climatic and other conditions present within the tropical belt. Climatic conditions depend in large part not only upon latitude but also upon altitude, the general conformation of the country, rainfall, prevalent winds, and humidity. On the one hand may be found areas in which European children can be reared in comparatively healthy conditions. On the other there are regions in which conditions to child life are extreme. In this article it is proposed to deal with the conditions commonly found in East and West Africa, in many parts of India and elsewhere; and a rough division will be made between the infant from birth to two years of age and the child from two to seven years of age.

Care of the infant, and in great part of the younger child as well, may be defined as the sum of all those methods which can be adopted to protect it from adverse factors in its environment. Since the infant is practically a non-motile organism, just as it lacks ability to search for its food, so it lacks the power to avoid approaching danger and the power of self-defence. In the same way it is unable to change its circumstances in response to heat and cold and is, in a sense, a poikilo-thermic animal, a point of vital importance in hot countries. Care of the child spells attention to detail: care of the child in the tropics spells attention to every detail by the mother, an onerous task.

The infant's clothing will be much the same as that during the summer months in a temperate country, the cot coverings being varied according to the season. The cot, which should be roomy and larger than those used in this country and of bedstead form, is best placed in the middle of the nursery. The room is preferably mosquito-proofed and well ventilated, and should be as barely furnished as possible, thus avoiding all shelter to mosquitoes. The mattresses should be firm and flat, and the bed-clothing as light as need be, so that the child is secured freedom of movement and fresh air. The same is necessary in the arrangement of the perambulator. Most infants and children in the tropics are, I think, overclothed. The cot or bed is fitted with a mosquito net of such a texture as to exclude not only mosquitoes but midges and sandflies, and so arranged that no part of the child's body or limbs can come in contact with it. Except the infant be under the eye of the mother or other trusted person, it should be similarly protected when in its perambulator. A constant circulation of air about the child should be sought and in some cases it may be necessary to employ artificial ventilation by punka or fan. On the other hand, means must be adopted to protect the child from chilling, when, as sometimes occurs, a fall of as much as 40°F. in temperature may take place between the evening and early morning. For younger children 'chilprufe' fabrics find a useful place. A child should never be allowed to soil its fingers on the floor, and never go unshod. Dummies should be disallowed.

The infant's toilet will not differ materially from that in any other part of the world; in hot weather the bath should be cooler and *vice versa*; cool sponging and later a cold shower are most useful for their general tonic effect and will not harm the healthy child. The greatest care should be taken to instil into the young infant a regular habit in evacuation of bowel and bladder so that soiling is avoided; further, scrupulous care is essential in changing soiled napkins, as the skin is very easily irritated in hot climates.

Although in this country the beneficial effects of the play of fresh air and of sunshine on the skin of the child are now well recognized, in most tropical countries

there appears to be a kind of superstitious fear in this regard, which is, in my opinion, much to the disadvantage of the child. Careful daily exposures to sunlight in the early morning, before the heat rays are too powerful, so that the body and limbs become well pigmented would, it is believed, do much to preserve the health of the child and acclimatize it to some of the factors of its tropical environment.

'Sunstroke' associated in the minds of most people with the actinic rays of the sun can no longer be looked upon as a clinical entity; all the effects direct and indirect of the sun's rays are due to overheating, and symptoms are just as likely to appear in those unexposed to direct sunshine. The danger point is a shade temperature of about 120°F. It is unlikely that children will be kept in such a climate, but lesser degrees of 'heat exhaustion' and 'heat hyperpyrexia' may be seen and demand immediate measures. The value of headgear is not to protect from 'sunstroke' but to obviate local heating effects and to give shade to the eyes.

Children living in the tropics not uncommonly suffer some degree of psychological disturbance. The single-child family, over-anxiety on the part of the mother, the presence of menial servants, over-stimulation and excitement, and insufficient sleep are all common factors in warping the child's outlook, but with care may be guarded against; a well-ordered life for the child is essential.

Feeding

All the reasons that have been urged in favour of breast-feeding in temperate climates hold good in the tropics where they are of paramount importance. It is therefore the more unfortunate that a large number of mothers in warm countries for many reasons are only too anxious to escape this duty; thus the medical practitioner, intent on doing his best for the child, will find his office a difficult one. In many cases the difficulty in maintaining breast-feeding is a real one, but if adequate care of the pregnant woman has been taken by ensuring a healthy mode of life, the exclusion of infection, the preservation of good bodily tone, the provision of a diet adequate in mineral salts and vitamins, the assimilation of a sufficient amount of fluid and the acquisition of a contented mind free from worry, their number should be reduced. The same care of the mother during lactation is necessary, each of the points above mentioned being of great importance in hot climates. Excessive cigarette smoking must be disallowed and only a minimum of alcohol permitted.

Details of breast-feeding will not be dealt with here, but the general principle of 3-hourly feeds, *i.e.*, at 6, 9, 12, 3, 6 and 10 o'clock for an infant of 10 lb., and 4-hourly feeds at 6, 10, 2, 6 and 10 for one over 10 lb. may be adhered to. In temperate countries the fluid intake required by the infant is approximately the same as the food (milk) intake, *i.e.*, about 2½ oz. per pound body-weight per day; on hot days the quantity of fluid required may be twice that amount. In the tropics the quantity of fluid necessary may be three or four times as great. This extra fluid, required above the milk intake, is best supplied in the form of half-strength normal saline. A common sign of insufficiency of fluid intake is staining of the napkins by the concentrated urine. Older children occasionally drink too much water (plain) and get diarrhoea in consequence.

Wet nursing appears to have gone out of fashion in tropical countries, just as it has here at Home. If adopted the greatest care in the selection of a native nurse must be exercised, as mentioned later when speaking of native servants.

Artificial feeding may be necessary to supplement or replace breast-feeding. In those areas where fresh cow's milk is available it is probably to be preferred. Details of the modification of cow's milk for infant feeding do not come within the compass of this article but it should be remembered that the constituents of cow's milk may vary considerably according to their

feed in tropical countries. The same applies to the milk of other animals which may be used—goat, buffalo, camel, ass.

All milk must be sterilized: while it is often possible to do something towards ensuring cleanliness in regard to the supply from animal to infant, the dangers of contamination are so manifold in hot countries that sterilization by heat and preservation from further contamination at a low temperature are essential. The dangers attendant upon a milk supply from a single cow are well known. The possibility of 'melitensis' and 'abortus' infections must not be lost sight of. Sterilization of milk, with some diminution of vitamin content, being essential, the addition of vitamins to the infant's dietary becomes necessary, and every baby should certainly after three months be given a drachm of cod-liver oil or its equivalent and two or three drachms of orange or tomato juice per day.

When fresh milk is not available, and this applies commonly during a voyage or long journey, recourse must be made to some proprietary milk preparation. Such preparations fall into several categories: (1) Sweetened full-cream condensed milk. (2) Unsweetened full-cream condensed milk. (3) Sweetened skimmed condensed milk. (4) Dried milks. No. 1 combined with a little cow's milk and cod-liver oil is sometimes useful. No. 2 with the addition of sugar and vitamins is an easily digested preparation. No. 3 is unfit for infant feeding. Under no. 4 a large number of preparations are on the market; their advantages are obvious. They are as a rule easily digested but vary somewhat in composition; each is useful in particular cases. Vitamins should be given when dried milks are used. Cow and Gate, Glaxo and Lactogen preparations are popular and brands specially prepared for tropical consumption are available.

Animal milk in tropical countries may be deficient in mineral constituents and the well-known bone and vegetable broth may be introduced into the diet of the infant with advantage at an earlier age than in temperate countries. The iron content may also be low and the anæmia of infants, one which responds to iron, should be borne in mind.

The feeding of older children needs no comment beyond again insisting on the need for the greatest care in the preparation and preservation of foodstuffs from contamination by dust, flies, and ants, upon the most scrupulous cleanliness of vessels and upon the effective sterilization of drinking water.

The amount of fluid required by a child at rest to replenish that lost via the skin is large and not always realized; with exercise this amount is far greater still. Fluid replenishment is best taken in the form of half-strength saline. An adequate supply of vitamins to the older child must also be ensured and may usually be obtained with a little ingenuity. Raw vegetables and fruits, which may be completely taboo in some countries, may be allowed where the conditions of production are certainly known and satisfactory. The danger of helminth and other infections should be remembered.

The prevention of bowel infections is, as elsewhere, a question of cleanliness of the food supply and non-contamination by insects, dust and the hands of native servants. The strictest supervision of the house, the larder, the kitchen and the compound should be observed. Flies and ants will come where food is available, where filth is allowed to collect, where garbage and refuse are exposed, where excreta remain undisposed. It is therefore a matter of compound sanitation. Rather in the same way evidence has been adduced more recently to show that the infection in malaria is commonly acquired from mosquitoes inhabiting the house and precincts, the same being true of other mosquito-borne diseases: if the house is kept free of mosquitoes, the risk of infection is greatly diminished. If the house possesses a second story the child should inhabit the upper rooms.

Infection

The reservoir of infection lies in great part in the native, in malaria mainly in the native children: it should therefore be an axiom that natives should not be allowed to reside in European quarters of a township, as far as possible, and native children should be rigidly excluded.

The local incidence of particular diseases will demand special precautions which cannot be detailed here, it is only necessary to call to mind the leishmaniasis, the relapsing fevers, the tropical typhus fevers, the filariases, and trachoma. Protection from insect vectors is the obvious line of defence.

It would be a good thing if all native servants could be medically examined. Watch could be kept for the common tinea infections of body skin, crutch, scalp and feet; for scabies, often found affecting the inter-natal cleft in natives; for chigger infection of the feet, and lastly for venereal diseases and yaws. In some areas the native population is nearly 100 per cent infected with syphilis, in others yaws claims a full 100 per cent, while in others again gonorrhœal infections are universal. The extremely common worm infections among the indigenous inhabitants of many countries also must not be lost sight of, and the method whereby infection is contracted remembered, if these infestations are to be avoided.

The watchword as regards the infant should be under all circumstances Prevention: with older children this may be more difficult. In regard to malaria quinine prophylaxis may be adopted, chocolate-coated preparations of quinine or euquinine (quinine ethylcarbonate) in condensed milk are useful; atebirin is also well borne by children. It is perhaps unnecessary to refer to the symptomatology of the many diseases in children, but the liability to the rapid development of fatal convulsions in infantile malaria must always be kept in mind. In the same way it must not be forgotten that the predominating symptom of bacillary dysentery in children is a toxæmia associated with convulsions and coma. This affection, however, in children often responds well to serum therapy. The differential diagnosis of diarrhoea in children under the headings dietetic, symptomatic and infective will always demand great circumspection. It is useful to remember that, certainly in most tropical countries, amœbic dysentery is very rare in children and that the danger of dehydration in diarrhoeal diseases among children in hot climates cannot be overestimated.

The care of European children in the tropics is no light task; it makes heavy demands on the mother and it will sometimes tax the knowledge and skill of the medical practitioners.

The Cod-Liver Oil Treatment of Wounds

By J. P. STEEL, M.D.

(Abstracted from the *Lancet*, 10th August, 1935, p. 290)

BURNS are seldom received at a hospital without first-aid treatment having been given outside, usually in the form of an oily dressing applied to the burnt area; for this reason the tannic acid method is not often applicable without extensive skin toilet, requiring in many cases a general anæsthetic. Picric acid is also extensively used for its analgesic properties, and tannic acid is not readily applicable on such a surface. Where skin toilet was not desirable it was the practice in this hospital to follow the first-aid dressing by the application of liquid paraffin or sterile vaseline, as continued application of picric acid had led to unpleasant results in cases of idiosyncrasy.

The application of cod-liver oil seemed so easy a method and so generally useful that it was decided to treat minor burns in an endeavour to estimate its value, and the comparison was very easy between tannic acid and the other oily dressings. It was soon decided that the use of cod-liver oil was quite justified, not only in burns of a minor degree, but also in those

of much greater extent and penetration. It has, in fact, been so successful that it is now almost a routine here to treat any burn with crude cod-liver oil. The main advantage is that, on admission, no matter what has been applied outside it is unnecessary to undertake any extensive skin toilet before applying dressings.

At first it was thought that cod-liver oil combined into an ointment with some waxy base would remain in closer contact with the burnt area, but it was soon found that the dressing, when the time came for renewal, was either dry or inclined to draw the granulated tissue away with the remains of the waxy ointment. To overcome this difficulty, lint, heavily soaked in cod-liver oil, was applied widely over the part to be treated, and was taken off at the end of 12 hours. With experience it has been found that once in 24 hours is sufficiently often to uncover the dressing, which is now left *in situ* and re-soaked with cod-liver oil, the lint not being taken from the skin surface until the end of 48 hours—an obvious advantage where the area to be treated is large.

Both Löhr and Winnett-Orr of Nebraska use the occlusive method, but the only occlusion that we have found necessary is to cover the dressing by jaconette, in an endeavour to keep the lint saturated. Crude cod-liver oil is used from the commencement in all cases. Where cases have not reacted previously to the ordinary dressings it has been found that cod-liver oil hastens recovery, and the speed with which an indolent area is transformed into one of healthy granulation is remarkable. The treatment too is popular. Almost every patient has said that the first application of cod-liver oil has given much greater ease than other dressings. One case, which is not illustrated, may be quoted.

A marine fireman, who was scarred in almost every part of his body, was burnt on the left arm, shoulder to elbow, whilst five days out from Liverpool, by a fall against the door of the ship's furnace. He sustained a burn of the third degree which was treated by picric acid on the boat, and on arrival at port he was sent to this hospital with all speed. He was in considerable pain and there was a good deal of toxicity from the picric-acid dressings. Cod-liver oil was immediately applied, and in 12 days he left the hospital with a completely healed surface and without any scars.

By a strange coincidence about 15 days later, on his return to port, he was sent into hospital by his panel doctor for an acute intestinal obstruction, and it was found that not only was there no scarring from the recent burns, but the brown pigmentation, which is so often left after this treatment, had entirely disappeared.

With our first few cases we obtained such good results in burns, that it was decided to try crude cod-liver oil as a dressing in other cases. Indolent ulcers and deep abrasions were so treated, but always following the rule 'if there is pus, it must be let out'. With this proviso cod-liver oil treatment has been found of advantage in a great number of slow-healing areas. After the removal of pus or gangrenous patches of skin, oil applied in the way described has induced rapid granulation of tissue previously indolent in leg ulcers and even in fistulae. One case of fistula had been in hospital 34 days under routine treatment and still showed a slight serous discharge. After packing the wound for six days with cod-liver oil the patient was able to leave hospital, and only needed to make two outpatient attendances for the renewal of the dry dressings.

Unless the distal and proximal surfaces of a joint are involved no immobilization is undertaken and no occlusion is attempted except that obtained by a covering of jaconette. Crude cod-liver oil is used and is applied by lint saturated therein. The dressing is not removed for 48 hours, but at the end of the first 24 hours—or more often if it seems necessary—it is re-soaked *in situ* with cod-liver oil. In certain cases at

the end of a week the granulations are found to be exuberant; cod-liver oil dressing is then replaced for 24 hours by red lotion or a paste with a zinc base.

The only disadvantage of the treatment, to which notice has been drawn, lies in the somewhat unpleasant smell from the dressing, but this can be mitigated by frequent change of bed linen. At one time we included an aromatic in the oil, but gave it up as it did not seem worth while. Sometimes the scent of the oil seems to make a patient less ready for his food, but this mild nausea soon passes away. The advantages are obvious: the ease which the patient obtains from the first dressing, the abolition of frequent change of dressings (with consequent pain and disturbance to the patient), and the almost total elimination of scar tissue. The brown pigmentation which is found on the healed skin clears up without further treatment.

A laboratory comparison was made between liquid paraffin and cod-liver oil, 10 c.cm. of either being inoculated with *Staph. pyogenes aureus*. In the case of cod-liver oil after 48 hours' incubation, subcultures on agar proved that although the organisms were still alive the growth was inhibited. The same result was obtained with liquid paraffin over a week. Obviously neither is a suitable medium for the growth of the organisms, and this will account for the change of an unhealthy surface into the 'clean ruddy picture of healing'.

Whether the vitamin content in cod-liver oil has a natural affinity for the skin and the underlying tissues it is difficult to say, but there is obviously some factor in cod-liver oil which is not present in such oily dressings as liquid paraffin. This 'something' has the effect of much more rapid healing and the almost entire elimination of scar tissue.

Reviews

LYON'S MEDICAL JURISPRUDENCE FOR INDIA: WITH ILLUSTRATIVE CASES.—By T. F. Owens, L.R.C.P. & S., Lieutenant-Colonel, I.M.S. (retd.). Ninth Edition. 1935. Thacker, Spink and Company (1933), Limited, Calcutta, and W. Thacker and Company, London. Pp. xvi plus 767. Illustrated. Price, Rs. 18

THE book has been recast and revised. Certain matters such as life assurance, not falling strictly within the scope of forensic medicine, have been omitted, while others such as the Medical Council for India and the provincial medical councils have been added. The size has been decreased by 75 pages. Yet, most of the familiar pictures are in their familiar places.

The myth of ptomaine poisoning has been cleared. Florence's test and Barberio test for seminal stain have been included.

One single item showing the least evidence of revision deals with blood groups. Doubts expressed regarding the determination of the group from blood-stains and regarding the determination of parentage from the groups of the alleged offspring and the alleged parents remain as strong as they were in the last edition. This is no longer the situation. Determination of the group from the stains either by the direct action of the isohæmagglutinin or by the absorption of the isohæmagglutinin is now well known. Bernstein's hypothesis of the inheritance of the blood groups is also well known. The irregular reaction in inheritance have been satisfactorily explained by the sub-groups A_1 and A_2 under A and by weakness of the hæmagglutinogens and the hæmagglutinins. 'As a matter of fact, a considerable number of "exceptions" to the Bernstein theory have been reported, but a comparison of the number of such cases before and after the theory was expounded reveals a remarkable decrease during the latter period. Thus, in the O × AB families, whereas

26.26 per cent of exceptions were found before 1926 only 3.61 per cent were found after that date. Similarly, in the A × AB families there has been a decrease from 3.77 per cent to 0.87 per cent in the number of exceptions; in the B × AB families the number of exceptions has dropped from 11.11 per cent to 0.83 per cent; and in the AB × AB families no exceptions were found at any time' (A. S. Wiener, 1934). Besides, the hæmagglutinogens M and N provide a check. Incidentally, the isohæmagglutinogens A₁ and A₂ and the hæmagglutinogens M and N have not been mentioned.

The preface by Colonel Waddell to the last (eighth) edition with two disputable claims is retained. In the new preface Colonel Owen has summarized lucidly the scope of the book without any strain on the superlatives.

The paper, the printing, the size and the binding are good. Inclusion of a plate, in colour, of the spectrum with the bands of the derivatives of hæmoglobin would be useful in the next edition.

The book will continue to enjoy, with added justification, the reputation it has already attained.

HANDBOOK OF PHYSIOLOGY.—By the late W. D. Halliburton, M.D., LL.D., F.R.C.P., F.R.S., and R. J. S. McDowall, M.B., D.Sc., F.R.C.P. (Edin.). Thirty-fourth Edition. 1935. John Murray, London. Pp. xi plus 971, with numerous illustrations in the text, many of which are coloured, and 4 coloured plates. Price, 18s.

THIS standard textbook has now reached its thirty-fourth edition and can, in spite of its age, be said to be modern in every respect. The editor is to be congratulated on presenting the subject of physiology in so concise and yet comprehensive a volume. A complete critique of the whole book is impossible and indeed unnecessary, and a comment on certain topics and chapters has been selected on account of some new features which have been incorporated.

The autonomic nervous system has been ably handled in a few pages and the recent work on humoral transmission cholinergic and adrenergic fibres incorporated. The cardiovascular system has justifiably been given a more exhaustive treatment and the student should be able to appreciate the information which modern laboratory methods, namely the oscillograph, has yielded in the elucidation of the nature of the nerve impulse and hence the function (among others) of the cardiac nerves.

The respiratory system includes all the most recent work on the subject and shows the effect on respiratory activity of an artificial embolus. Such innovations are of the nature of experimental pathology and should be of considerable value to the thoughtful student when he meets such conditions in the wards. The book is eminently suited to the average medical student and yet provides material for the more intelligent ones who realize the importance of a sound understanding of physiological facts and principles in the interpretation of symptoms at the bedside. The undergraduate would be well advised to keep this book by his side throughout the latter part of his medical curriculum.

H. E. C. W.

PUERPERAL GYNÆCOLOGY.—By J. L. Bubis, M.D., F.A.C.S. 1935. Baillière, Tindall and Cox, London. Pp. xxiii plus 199, with 81 illustrations. Price, 16s.

It must be acknowledged that a large number of pregnant women suffer pathologically, as the result of what is actually a physiological process.

It is a matter for regret that a natural process such as labour should leave in its train—cystoceles, rectoceles, prolapses, chronic infections of the cervix, and innumerable other troublesome complications. The duty of the doctor is to obviate these complications and to return the mother to her home as fit as before she became pregnant. Gynæcological statistics indicate that this ideal is seldom reached.

For 18 years, Dr. Bubis has been advocating the immediate repair of injuries to the birth canal. It seems incredible that he should have to do so—but it is equally incredible that few doctors ever examine the birth canal after delivery. Dr. Bubis has broken new ground by writing a book of 180 pages—divided into 18 sections, the first three of which are devoted to anatomy, pre-natal care and delivery, the latter containing an excellent résumé of anæsthesia and analgesia for labour cases. Four sections are devoted to puerperal and gynæcological operations. Two sections devoted to 'puerperal care following delivery and repair' and special therapy are particularly worthy of note.

The book is profusely and clearly illustrated; abundant statistics are given to prove the authors' contentions. Many would object to carry out complete repairs after delivery. Whatever criticisms may be advanced, few will deny the author's statement that 'the slightest laceration is worthy of attention'.

The book should be in the hands of all medical men and women practising midwifery. It contains much food for thought and even if half the author's recommendations are acted upon, the mother will be benefited.

S. N. H.

UROLOGY IN GENERAL PRACTICE.—By A. E. Roche, M.A., M.D., M.Ch. (Camb.), F.R.C.S. (Eng.). 1935. H. K. Lewis and Company Limited, London. Pp. xii plus 355, with 3 coloured plates and 40 figures. Price, 17s. 6d.

THAT a sound working knowledge of urology in general practice is not only of increasing importance, but an absolute necessity, is emphasized by the great number of books on this subject that have made their appearance in recent years.

Mr. Roche has added to the literature on urology an excellent little book, written in a free and easy style, and containing many quips of a humorous nature. It is definitely intended for the general practitioner, and should prove of great use to him. The volume is divided into ten parts, the first two being concerned with the investigation of a urological case and urinary symptoms. The next seven describe pathological conditions under regional headings, such as kidney, prostate, etc. Embryology is not described, and no condition is dealt with at length, which is in keeping with a book of this size.

The section on tuberculosis of the kidney occupies only two pages, but torsion of the spermatic cord, and of the hydatid of Morgagni are dealt with fully.

In describing catheterization of the bladder and ureters, and also cystoscopy, the author insists on the very true dictum, that gentleness is the keynote of success, and he gives many useful suggestions to be borne in mind when performing any of these examinations.

All the sections are well written and contain those essentials which are necessary for the general practitioner. The tenth part is a short synopsis of recent advances in urological treatment. The illustrations consist of skiagrams and photographs, and there are three coloured plates.

H. E. M.

MANUAL OF HUMAN PHYSIOLOGY.—By Sir Leonard Hill, M.B., LL.D., F.R.S.Hon.A.R.I.A. Fourth Edition. 1935. Edward Arnold and Company, London. Pp. xii plus 470. Illustrated. Price, 6s. 6d.

THE fourth edition of Sir Leonard Hill's excellent *Manual of Human Physiology* brings this work fully up to date. The whole text has been thoroughly revised so as to keep pace with the recent advances. The inclusion of the chapter on reproduction has made the book complete. Being an essentially elementary book, it must include some of the simpler facts of anatomy for the proper elucidation of the subject to

beginners. Such subjects as are of general interest have been laid stress on, while all unimportant details have been excluded. The book is designed for the higher classes of schools and polytechnics, and for nurses undergoing hospital training and one can confidently recommend it to these.

R. N. C.

THE PHARMACOLOGICAL ACTION OF HARROGATE DRINKING WATERS.—By W. Bain, M.D. (Dunelm), F.R.C.P. (Lond.), F.R.C.S. (Edin.). 1935. J. and A. Churchill Limited, London. Pp. vii plus 53, with 26 illustrations. Price, 5s.

THE publication of this book is timely, for there is no work of this kind available and it will help to put spa treatment on a rational and scientific basis. The author has endeavoured to investigate the Harrogate drinking waters from a pharmacological point of view. Of the eighty-eight different springs, complete analysis has been made of only fourteen which are used for drinking purposes. In the different chapters the author deals with the action of the water on the gastro-intestinal tract, biliary passage and cardiovascular system. The text is well illustrated with graphs that are very instructive. The book will be of interest to all medical practitioners and especially to those making use of spa treatment.

R. N. C.

THE SNAKES OF INDIA.—By Lieut.-Col. K. G. Gharpurey, B.A., F.R.G.S., F.Z.S., I.M.S. 1935. The Popular Book Depot, Lamington Road, Grant Road, Bombay. Pp. x plus 165. Illustrated. Price, Rs. 3

A SMALL but a comprehensive book dealing with Indian snakes written in very simple and non-technical language fit for general practitioners and laymen was urgently required. We have always felt the necessity of some book to which to refer people, as we have had

to reply to many enquiries regarding the identification, classification and treatment of snake bites.

This volume is an excellent attempt to fulfil all these requirements. It gives briefly, in simple and concise language, the general description of the important snakes of India with the salient features regarding their classification and identification. Seventy-six illustrations and diagrams are given to illustrate the different types of snakes. Five pages have been allotted to the first treatment of snake bite. Special stress has been laid on the fact that out of 300 important Indian snakes only 40 are poisonous and out of these the majority are cobras. Hence out of every 5 cases of snake bite only one is by a poisonous snake, but out of every 100 cases bitten 90 cases survive without any treatment. This exposition should give great encouragement to victims, who are so frequently subject to great shock through fear alone.

We strongly recommend this book to students and practitioners and people in out of the way places, such as forest offices, military offices, factories and plantations.

R. N. C.

OTHER BOOKS RECEIVED

Facts and Fallacies of Practical Birth Control—including an Examination of the 'Natural Method' of Contraception of the Gräfenberg Ring, and of Sterilization. By G. R. Scott, F.R.A.I., F.P.H.S. (Eng.), F.Z.S. Published by Messrs. T. Werner Laurie Limited, London (Cobham House, 24 and 26, Water Lane, E.C. 4). Pp. ix plus 156. Illustrated. Price, 5s.

Leprosy: With Special Reference to its Occurrence in India. By S. N. Malhotra, M.B., B.S. (Pun.), F.C.P.S. (Bom.), M.D. (Voll.). 1935. Published by The Rayan Pharmacy (Publishers), 97, Girgaum Road, Bombay. Pp. 110. Price, Rs. 4-4

Abstracts from Reports

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1933. VOLUME I. ON THE STATE OF THE PUBLIC HEALTH IN BRITISH INDIA AND SOME INDIAN STATES

1. THE chief vital statistical facts relating to British India for 1933 are:—

(1) Total births numbered 9,678,876 giving a crude birth rate of 35.5 per mille as compared with 33.7 in 1932.

(2) Total deaths numbered 6,096,787 giving a crude death rate of 22.4 per mille as compared with 21.6 in 1932.

(3) Infantile deaths numbered 1,650,973, or 27 per cent of the total mortality, giving an infantile death rate per 1,000-births of 170.5 as compared with 168.7 in 1932.

(4) The crude increase in population was 3,582,089 which gives a rate of 13.1 per mille.

In these four short paragraphs are summarized the main health statistics of India for 1933 and they may conveniently be made the text for the introductory paragraph of this annual review.

In the first place it is clear that there has been no violent disturbance in the Indian vital statistical world. The birth rate, though somewhat higher than in the two previous years, has merely returned to the average level recorded during the 33 years of the present century and the slight reductions recorded during 1931 and 1932 seem to have been merely fortuitous in character and cannot be taken to indicate that there is any tendency for the Indian peoples to follow the example of western nations in

respect of restriction of families. The death rate is slightly higher than that recorded in 1932 but does not show any great departure from the downward trend which has characterized the general death rate since the great influenza epidemic of 1918-19. Unfortunately, the same cannot be said of the infantile death rate. In the 1931 report attention was drawn to the downward trend in this rate following the disastrous years of 1918 and 1919 but the recorded rates of the past 6 years seem to indicate that that trend has disappeared. Since 1928, in fact, the annual figures for infant mortality have fluctuated only slightly between 181 per 1,000 births in 1930 and 169 in 1932 and the figure for 1933 again lies between these two contiguous limits. It seems that, for the present, the factors influencing infantile mortality are comparatively stable and that new and more vigorous preventive measures will have to be planned and put into execution before a further saving of infant life can be expected. No public health officer can look with any degree of equanimity on an annual death roll of nearly 1½ million infants below one year of age and if, as has been repeatedly stated, the infant mortality rates of a nation provide an accurate estimate of its sanitary conditions then India has little cause for satisfaction as regards the state of its public health. The further deduction may be made that existing campaigns in the fields of child welfare and maternity relief have had so far little or no widespread influence, although no doubt in the restricted areas in which they are carried on a considerable effect may have been produced. As a matter of fact the small degree to which this form of preventive work has so far developed makes it evident that the merest fringe of the problem has been touched and it could

not possibly have produced effects sufficiently profound to have influenced the infantile death rates common to the general population of rural India. In any case, these facts and figures indicate the enormous problems awaiting attack and make clear the extent of the health work facing the new provincial and central Governments which will shortly come into being under the reformed constitution.

The three main epidemic diseases, cholera, plague and smallpox, together caused 214,590 deaths but although this number is somewhat higher than in the previous year, owing to an increased prevalence of smallpox, the combined death rate was only 0.9 per mille. Cholera was for another year only a minor problem, and although it is dangerous to be optimistic, it seems unlikely that India will in the future suffer the devastating pandemics which were a feature of the later years of the 19th century. Plague once more shows a reduced incidence and although the total deaths still numbered nearly 43,000, in this case also, the disease appears to be gradually dying out. Smallpox deaths increased in a disconcerting manner from 45,000 in 1932 to 103,000 in the year under review and the epidemic was fairly widespread over the whole of the Indian peninsula. The present exacerbation after a series of years of comparative freedom from epidemic smallpox indicates how far India still has to go before this disease is satisfactorily controlled.

Of the 3½ million deaths registered as due to 'fevers', probably a large proportion were actually caused by malaria. It is also a fair assumption that numbers of malaria deaths were recorded under 'other causes'. Remembering also that 12½ million diagnosed cases of malaria attended at hospitals and dispensaries, it may be fairly estimated that during 1933 malaria exacted a toll of at least 1,000,000 lives. This terrible mortality is apt to be lost sight of owing to the defective and misleading nature of statistical records and because of the less dramatic nature of the disease as compared with cholera, plague and smallpox, except when a violent epidemic occurs such as that of 1908 in the Punjab. But year after year in India, malaria is probably responsible for about 20 per cent of the total recorded deaths and many millions of the population experience periods of sickness which cause grave loss of earning power and much economic distress. The problems associated with the prevention of malaria in this vast sub-continent are such as might well daunt the most courageous, for the poverty of the people and the lack of resources among local boards and municipalities prohibit all expensive measures. During recent years a number of local governments have made successful attempts in certain particularly malarious areas to provide the stricken populations with free supplies of quinine and, even although here also lack of funds has restricted effort, a considerable degree of betterment has been achieved. In a later section of this report an attempt has been made to estimate the amounts of quinine distributed through hospitals and dispensaries and by public health staffs in the different provinces and a brief examination of the figures will show how ludicrously inadequate these quantities are. At the same time, under present circumstances, probably more benefit can be conferred by the distribution of quinine than by other anti-malarial measures and it is to be hoped that the Government of India will be able to accept the suggestion that its reserve stocks of quinine should be gifted to the provinces in order that, even temporarily, more adequate supplies of the drug may reach the people. It is an unfortunate fact that India cannot herself produce anything like the amount of quinine her population requires and that present prices make it largely a prohibitive luxury to most of her people. Nevertheless it is urgently important that larger quantities should be made available, for it is difficult to suggest other means of succour to the millions who suffer from this deadly disease.

At the risk of being accused of vain reiteration, it seems once more necessary to invite attention to the increasing gravity of the problems associated with the

continued growth of the population which still proceeds apace. During 1933, the population of British India increased by over 3½ millions, and the estimated population at the mid-year period was nearly 273 millions. There is no reason to think that in the Indian States the same increase has not occurred, for these States are in such intimate relationship with different parts of British India, that any factor tending to reduce numbers in one, would exert a similar force in the other. This means that since the end of February 1931, nearly 18 millions have been added to the population of India and on a conservative estimate the total must now be approximately 370 millions. This estimate is almost certainly conservative because, for the purposes of these calculations, the rate of increase has been taken as that recorded during the decade 1921-31. This rate has, however, been considerably exceeded each year since the census of 1931 so that it would not be unduly stressing the case to add another 2 millions to the grand total. Even with this omission, however, the problem is large enough and if existing conditions continue—and at the moment of writing no indication of change is evident—there seems little doubt that by 1941, when the next census is taken, the population of India will considerably exceed the estimate of 400 millions given in last year's report. The population problem in India is therefore a real one and because scepticism still exists in the minds of certain authorities who continue to ignore facts, that problem demands further examination from an angle which, so far as I am aware, has not yet been given sufficient attention. The late Mr. Joseph Chamberlain, at one stage of his political career, spoke of 'three acres and a cow' as providing a sufficient standard of living for the average English agricultural labourer and this famous phrase has been frequently used since as forming a suitable basis on which to found arguments intended to defeat *laissez faire* opposition. Examination of the figures in India gives interesting results. The total land in British India amounts to 667 million acres but of this total only 232 million acres were cultivated and sown, 47 millions lying fallow, 154 millions being culturable but uncultivated, 145 millions being not available and 89 million acres consisting of forests. Even making the ridiculous assumption that the whole 667 million acres of land were available, this works out at only 2.44 acres per head of the population. A more reasonable assumption would be to take the acreage made up of cultivated and sown, fallow, and culturable but uncultivated. These three items total 481 million acres which gives only 1.75 acres per head of the population. But some land must be allowed to lie fallow, an additional proportion must be given over to the cultivation of crops other than food and, during 1933-34, the total acreage under food crops amounted to only 206½ million acres. This gives only 0.72 acre per head of the population in British India and it does not require more than an elementary knowledge of agriculture to realize that it is impossible to provide a sufficiency of food for the present population of India from an acreage of this dimension. It may even be held that were all available cultivable land given over to food production alone, the supply would fall short of reasonable and adequate demand. In order to forestall the usual argument, it can be admitted that the present shortage *might* be met for a short period of years by more intensive methods of cultivation, but that implies the immediate adoption of these intensive methods all over India and to those of us who know the village *ryot*, it is difficult to envisage a solution of the problem along those lines. Even supposing that additional food supplies were made available in this way, however, the difficulties would only be postponed for a few years, because the increased numbers of the population would rapidly absorb the surplus. Apparently, therefore, the problem of numbers in India is even more acute than before and it is one of such importance to the welfare of this country that it deserves immediate examination and certainly more detailed notice than it receives in paragraphs of this

report. Numbers are so intimately bound up with economics that the problem is one which affects every department of Government and every class of citizen. It is a question which will shortly force itself upon the attention of every man and woman in this country: it is hoped that it will receive adequate notice before disaster befalls.

SECTION II

History of chief diseases

Chief causes of mortality.—The 'fevers' group, no doubt including most of the deaths in which fever was a notable symptom of the fatal illness, is once more the largest and comprises nearly 58 per cent of the total deaths with a death rate of 12.9 per mensem. Deaths recorded under 'other causes' seem to remain fairly constant as the percentage to the total, viz, 27 per cent, and the death rate of 6.1 per mensem are both much the same as last year. The respiratory diseases group comprises 7 per cent of the total and gives a death rate of 1.6 per mensem, both figures also being similar to those of 1933. The only deaths which are registered with a reasonable standard of accuracy are those from cholera, plague and smallpox, but even in these instances the absence of death certification makes the recorded figures somewhat incomplete and unreliable. Deaths from true cholera are frequently registered as 'diarrhoea' and deaths from dysentery and diarrhoea as frequently find their way into the cholera category; smallpox deaths are recorded as measles and chicken pox and *vice versa*, whilst, owing to the ignorance and carelessness of those responsible for registration, cases in which fever has been a marked feature of the illness are buried under the omnibus term 'fevers'. As regards 'other causes' a large proportion of these deaths in Burma were ascribed to debility and anaemia, circulatory, urinary and digestive diseases; in the Central Provinces 3,457 deaths followed child-birth, 2,452 were due to measles and chicken pox and the remaining 105,631 to causes 'for which there is no separate column in the vital statistics form or which the reporting agency was unable to classify'. In other provinces similar conditions prevail. The methods in vogue detract greatly from the epidemiological value of the recorded statistics and little improvement can be expected until suitable registration agencies are constituted. Generally speaking, this will be a difficult problem for many years to come, but there are nevertheless a number of minor improvements which could be introduced without much delay, difficulty or expense. These include (1) the compulsory certification of causes of deaths in urban areas; (2) the adoption in prescribed areas of the International 'short' list of causes of death and (3) a uniform extension of the present list of notifiable diseases. Valiant efforts have been made in certain provinces during recent years to verify at least a proportion of the recorded deaths and, as might have been anticipated, wide variations have been obtained between the figures returned by the ordinary and the verifying agencies. At the same time, until some system of this kind is generally adopted, the statistics of mortality in India dealt with in this section must remain mere approximations and can only be used for analytical purposes with considerable reserve.

With the transfer of 'public health' in 1919 to local Governments the onus of initiative in improving registration has lain on provincial health departments and whilst in certain provinces considerable and successful efforts have been made in this direction, generally throughout India the results achieved have been so far disappointing.

Cholera.—During 1932 and 1933 the incidence of cholera was the lowest recorded in India during the last 60 years. In the former year, the long-wave cholera cycle was at its minimum and it was anticipated that 1933 would record an increase. This increase duly occurred though it was slight and most of the cholera was confined to the western districts of the Central Provinces, to the eastern districts of Bombay Presidency and to Hyderabad State, with an exacerbation

in Assam. Total recorded deaths numbered 68,318 as against 67,219 in 1932 and these figures compare very favourably with that of 354,438 which is the mean for the 5-year period of 1928-32. Throughout the 57-year period from 1877 to 1933, for which reliable records are available, only in 12 years have recorded deaths been fewer than 200,000; in the other 45 years cholera has regularly been the cause of a very high mortality, the deaths varying between 217,000 in 1893 and nearly 800,000 in 1900.

In the form of a concentrated picture of past and present events the recorded cholera deaths by quinquennial periods from 1877 onwards are given below:—

Period	Total deaths	Annual average
1877-81	1,468,487	293,697
1882-86	1,457,114	291,423
1887-91	2,030,020	406,004
1892-96	2,243,590	448,718
1897-01	1,942,016	388,403
1902-06	1,862,132	372,426
1907-11	2,023,514	404,703
1912-16	1,675,833	335,167
1917-21	1,986,978	397,396
1922-26	742,184	148,437
1927-31	1,509,680	301,936
1932	67,219	67,219
1933	68,318	68,318

These figures show that the violently explosive outbreaks of earlier years are now less frequent. This feature reflects credit on the publicity and preventive campaigns launched by provincial public health departments, the Indian Red Cross and other voluntary associations. Although every province still ordinarily shows its own seasonal curve, it is satisfactory to note that all have shared in the general decline.

Judging from the provisional data now available, the cholera wave has continued to rise during 1934, so that the usual cycle seems to be in course of development. At the same time, no very severe epidemic is anticipated; the large decline in incidence during recent years, as compared with the high peaks recorded during the last decade of the 19th century and the early years of the present century, suggests that certain new factors have been at work throughout the country in reducing the severity of this endemic disease. Whilst, therefore, the long-wave cycle is still in evidence and an increased incidence is likely to be recorded during the next two to three years, there is every hope that the cholera mortality figures will not reach undue dimensions. This hope is born of the knowledge that preventive work during recent years has been peculiarly successful in all the larger *melas* and religious gatherings, where millions of pilgrims are wont to attend. Almost without exception public health departments have reported a complete absence of cholera during and after these gatherings which were formerly such hotbeds of infection, and this alone must have the most profound influence on the incidence of the disease over wide tracts of the country. Another factor of importance is the increasing use of anti-cholera vaccine which is now well known to give a high degree of protection. The continued cheapness of food grains and the prevention of anything approaching famine conditions are additional factors favouring the reduction and control of cholera outbreaks. Speaking generally, therefore, it seems unlikely that in the future India will ever again suffer so severely from this disease as it has done in the past, although this will of course depend on continued vigilance on the part of every public health department and on immediate action when outbreaks occur. Whilst some cause for optimism exists, however, there is nothing in the present situation which can permit of any relaxation on the part of the public health officers; rather does it require renewed effort in order that India may eventually become free of this dreaded scourge.

Anti-cholera measures.—Routine sanitary measures such as improvement of water supplied in villages and

Bombay Presidency.—Preliminary experiments were carried out at the Haffkine Institute by Lieutenant-Colonel S. S. Sokhey, I.M.S., in artificial 16 feet long zig-zag burrows covered with plate glass sealed down with mud. Rats in perforated metal cylinders and fleas in muslin bags were placed at different points in the burrows and free rats were also introduced; cyanogas dust was then pumped in. This experiment, repeated several times, showed that rats and fleas up to a distance of 16 feet were invariably killed.

Similar experiments in natural burrows found in a dilapidated roofless house in Poona city indicated that 96 per cent of the rats present were killed. Encouraged by these results, Bijapur town, where plague had only been absent one year since 1924, was selected for a trial. Out of 2,400 pounds of the dust supplied to the municipality, 1,644 pounds were actually used. The freedom of the town in 1934 was attributed to the use of cyanogas dust but, to confirm the results, it is proposed to extend the operations to a selected group of villages. In one house in Bijapur town, all rats and fleas were destroyed, not only in the three rooms directly fumigated but those in the fourth room having free communication with one of these rooms. In another room, which was shut off from the fumigated rooms by a small door, about half of the rats escaped and 10 dead rats and a dead lizard were found to have fallen from the roof. In another part of the same town, where grain godowns are situated, 503 houses containing 2,233 rat burrows were fumigated and here even the rats and snakes that left the burrows died after a short time.

In addition, 5,300 pounds of cyanogas dust were supplied to 16 other local bodies in British districts and Indian States, but the results obtained are not yet known.

Punjab.—With a view to the adoption of cyanogas for the destruction of rats and fleas in infected areas in lieu of, or as an auxiliary to, *bhoosa-battis*, preliminary experiments were conducted with cyanogas dust 'A' both in artificial and natural rat holes, in the fields as well as in houses. It was found that the minimum period of exposure to the gas required was 2 minutes. The following conclusions were recorded:—

(i) Experiments carried out with *bhoosa-battis* in the Punjab Epidemiological Bureau in 1926 indicated that the lethal range of the smoke did not extend beyond 10 feet for the rats and 5 feet for the rat fleas. On the other hand, with cyanogas the range of destruction for both rats and rat fleas has been found to extend to a distance of 15 feet from the mouth of the rat hole.

(ii) About one in eight of the *bhoosa-battis* were extinguished soon after the rat holes were closed with mud and consequently failed to destroy the inmates. There is no such difficulty in the case of cyanogas.

(iii) *Bhoosa-battis* are harmless to human beings but cyanogas with a low diffusive power should not be a source of danger if it is handled by a competent staff. Moreover if doors are left open, only a small concentration of the gas is retained in the air of the room and within 2 hours after the house is opened up only slight traces of the gas are left.

Burma.—Fumigation with cyanogas was begun in October 1934, and so far outfits have been obtained by 37 municipalities, 19 district councils and 7 other institutions and 1,265 pounds of the fumigant have been purchased. It is not possible to give definite results as yet but the degree of success has apparently varied in different localities. In the town of Mandalay, this new method of killing rats and their fleas has been a pronounced success, plague deaths having totalled only 14 during the last plague season as against an average mortality of 739.

Smallpox.—During 1933, over a quarter of a million cases of smallpox were recorded with nearly 104,000 deaths. These figures are the highest for several years past and, considered apart from the influence of preventive measures, indicate that like the other great epidemic diseases of India smallpox continues to adhere

to a long-wave cycle which has a fairly regular periodicity. In Bihar and Orissa which had severe epidemics during 1925 to 1927, the present cyclic increase was anticipated a year in advance and the Director of Public Health explains the increased mortality in the following words:—

'It is a known fact that vaccination prevents and limits outbreaks of smallpox, but still the rate of mortality from this cause tends to show sharp rises at times in this province. This is due to the fact that a large number of children escape even primary vaccination and thus remain unprotected. Besides, the immunity conferred by vaccination gradually declines with the passage of time, with the result that protection passes off within 6 to 7 years'.

This explanation seems applicable to other parts of India as the 1933 epidemic was widespread and of the total recorded deaths, 16,936, or over 16 per cent, occurred amongst infants and 27,390, or over 26 per cent, amongst children between 1 and 10 years. But there were exceptions and it is probable that these areas which escaped during 1933 will record epidemic outbreaks during 1934 and 1935.

With the exceptions of the Central Provinces and the two outlying provinces of Assam and Burma, every province reported a higher incidence and in Delhi, Bihar and Orissa and Ajmer-Merwara the increases were marked. In Delhi province, over 90 per cent of the smallpox deaths occurred among children under 10 years of age, which fact certainly reveals defects in revaccination work; probably the same may be said of Ajmer-Merwara. The North-West Frontier Province and the Punjab were less severely infected but in the former the death rate was 7 times the quinquennial mean and in the latter it was nearly double that mean. The Presidencies of Madras and Bengal each recorded twice the number of deaths registered during the previous year and Bombay Presidency had almost three times as many as in 1932. These are decidedly disquieting figures, even taking into account the cyclic periodicity of the disease and it is to be hoped they have acted as a spur to the health departments concerned in their preventive efforts. They should also have provided due warning to provinces like the Central Provinces and Assam which have so far escaped from the present epidemic, for the portents are that these areas will later suffer unless active steps have been taken to push both vaccinations and revaccinations.

It may be of advantage to individual health officers and others to note here some of the more apparent factors which go to discount preventive campaigns against smallpox in this country. Even where notification is compulsory it is not properly enforced; the loss of time involved inevitably postpones adoption of preventive measures which require prompt application if isolated outbreaks are not to assume epidemic proportions. On the other hand, where early notification has been made, outbreaks have been quickly and successfully controlled. Again, large numbers of children remain unprotected because of defective registration of births and because in nearly all rural areas and even in many urban areas vaccination has not been made compulsory. The first of these handicaps has been reduced considerably during recent years and it is to be hoped will soon disappear. The second is a matter which should be the concern of every officer engaged in public health work and can only be removed by patient and continued educational activities. Again, revaccination is not compulsory except in a few centres and as a result many individuals are never vaccinated after infancy. The acceptance of this preventive measure can only be achieved by propaganda suited to the populations which it is meant to influence. Lastly, isolation of smallpox cases is hardly ever practised because there are few infectious diseases hospitals in existence and because, even if there were, existing legislation is very defective and public opinion is non-existent as to the desirability of isolation. These are

at *melas*, etc.; improvement of conservancy, medical inspection at railway stations of pilgrims, and the employment of epidemic staffs were adopted in various centres as and when necessary.

Inoculation with the anti-cholera vaccine is now generally accepted in India as a preventive method of proved efficacy. Whilst in some few endemic areas a proportion of the population has reached the stage of asking for inoculation on the approach of the cholera season, unfortunately it is ordinarily resorted to only after an outbreak has occurred or when an epidemic threatens to break out. But even then it has its valued place in preventive campaigns and in most areas the people are willing to submit themselves to inoculation as they are well aware of the protection it confers. With the growth of district health organizations and especially where whole-time health officers are employed, it is now much more easy to bring this preventive method to the average villager and in the absence of other more permanent measures, anti-cholera inoculation will for long continue to be one of the most valuable weapons in the hands of public health staffs. Further records have been collected in order to demonstrate the varying incidence of the disease amongst inoculated and non-inoculated groups.

Plague.—The upward trend in the mortality curve recorded in the preceding two years was not maintained, the total deaths in 1933 decreasing to 42,631. The reduction in incidence was particularly marked in Northern India where plague has long been endemic. Provisional figures for the early months of 1934 indicate, however, that the comparative calm of the last 5 years in this endemic focus is likely to be disturbed by an outbreak of moderate intensity. During 1933, the most important plague focus in North-East India, which includes the foot-hills of the Himalayas in the eastern United Provinces and western Bihar, reported only mild or sporadic infection; although in the upper Ganges Valley infection was somewhat severe. In the Punjab, a mild epidemic continued to be reported in the sub-montane tracts. The increased mortality in the Peninsula and especially that in Bombay Presidency was the only real disquieting feature. In Bombay Presidency the epidemic curve, after reaching its annual peak in December 1932, declined steadily during the first five months of 1933, but thereafter took an upward trend reaching its maximum in October and the total plague deaths in this area were the highest since 1924. The most heavily infected districts were Bijapur, Belgaum, Dharwar, Satara and Sholapur in the Southern Registration District—in which area the disease persists in endemic form—and Poona in the Central Registration District. These areas accounted for over 97 per cent of the provincial total. The most noteworthy feature of plague during 1933 therefore was its continued persistence in its old haunts. In the Central Provinces, although mortality was generally low, the districts of Chhindwara and Hoshangabad in the Machadeo Hills again suffered worst. In the Madras Presidency, Bellary district recorded 61 per cent of the provincial total. North-West Frontier Province, Delhi and Ajmer-Merwara remained free as did the whole eastern seaboard of India, northern Burma, Assam, Bengal, the south-east parts of Bihar and Orissa and the western areas of the Punjab and upper Sind.

Burma.—Plague is generally a disease of the cold weather in this province and during 1933 the highest mortality was recorded in January, February, March of the year. The total of 972 deaths compares very fact that India's annual average of 4,826; in fact amount of quinine per mensem was the lowest present prices make action of the disease in 1905. most of her people. Whilst trapping and poisoning important that larger part in a well-organized able, for it is difficult to just plague, these measures to the millions who are infected rat-flea which in At the risk of being an important factor in spreading seems once more necessary recent years more and increasing gravity of

more attention has been paid to the life history of rat-fleas and to the epidemiological features which favour their breeding; an obvious corollary to investigations in those directions is experimentation devised to discover the most suitable methods for destruction of these insects by disinfestation of rat burrows which afford the main harbourage both for rats and fleas. With this end in view, experiments have been carried out in several centres during the past year or two with various preparations which contain a considerable proportion of HCN. Generally, the results obtained have been very encouraging and it appears likely that by means of one or other of the HCN products now on the market, the development of plague can be largely controlled, provided suitable apparatus and methods are adopted. A brief summary of the experiments carried out in Madras, Bombay, the Punjab and Burma is here recorded; this should be of direct interest to public health officers who have to deal with plague-infected areas.

Madras-Cumbum Valley.—Epidemic plague has been in existence in Cumbum village from 1926 onwards. In March 1932, an attempt was made to fumigate every rat burrow in every house of this village, no less than 11,948 burrows in 2,210 houses out of a total of 3,334 being treated. While the burrows were being inspected prior to fumigation, dead rats were occasionally found and a few of these showed signs of plague infection. The 1932 outbreak in and around the Cumbum Valley was fairly severe, a total of 2,014 cases and 701 deaths being recorded. Eighty-seven cases of human plague occurred in the village itself in the latter half of 1931, 30 in January, 9 in February and 4 in March 1932, when fumigation was begun. No further plague occurred until January 1933 (3 cases) and February (7 cases) and none thereafter until February 1934. Every attempt was made to obtain the earliest information of rat falls or human plague and as soon as a plague-infected rat was discovered, the house concerned and the adjacent houses were again fumigated. In all 110,000 burrows were treated and whilst the number of animals dying inside the burrows could not be ascertained, 3,150 dead rats were found outside the burrows and, in addition, 1,156 mice, 232 bandicoots, 11 field rats, 9 musk-rats and a number of snakes, frogs and lizards were picked up dead. In six localities fumigation was carried out after rat falls were discovered and no further rat falls and no human plague cases were detected. Twenty localities were fumigated at times when human cases were occurring there almost daily and the outbreaks appeared to be checked. Four localities which were fumigated towards the end of the 1932 epidemic remained entirely free during 1933 and a further 6 localities were apparently protected from plague by fumigations carried out after neighbouring villages were heavily infected. In only 2 villages were the results disappointing. The work done in this area appears to furnish strongly suggestive evidence that fumigation with cyanogas is of considerable value in the prevention of plague. Further experiments carried out during 1934-35 have shown that where fumigation is carried out sufficiently early, the epizootic is promptly aborted. Villages which were fumigated when infection threatened either completely escaped or the onset of the outbreak was considerably delayed. During this period a further 184,000 rat burrows were treated in and around 16,000 houses in 25 different localities and thousands of rats, mice and bandicoots were killed.

In view of these encouraging results, the use of cyanogas was extended to the plague-infected villages of Bellary district and with a grant from Government towards the cost of pumps and cyanogas powder, fumigation of rat burrows during the plague off-season was proposed. As a result of the field researches in this direction, a revised memorandum on plague preventive policy has been prepared and submitted to the Madras Government for their approval. This memorandum includes a note on the technique of cyanogas fumigation and the precautions to be adopted.

Bombay Presidency.—Preliminary experiments were carried out at the Haffkine Institute by Lieutenant-Colonel S. S. Sokhey, I.M.S., in artificial 16 feet long zig-zag burrows covered with plate glass sealed down with mud. Rats in perforated metal cylinders and fleas in muslin bags were placed at different points in the burrows and free rats were also introduced; cyanogas dust was then pumped in. This experiment, repeated several times, showed that rats and fleas up to a distance of 16 feet were invariably killed.

Similar experiments in natural burrows found in a dilapidated roofless house in Poona city indicated that 96 per cent of the rats present were killed. Encouraged by these results, Bijapur town, where plague had only been absent one year since 1924, was selected for a trial. Out of 2,400 pounds of the dust supplied to the municipality, 1,644 pounds were actually used. The freedom of the town in 1934 was attributed to the use of cyanogas dust but, to confirm the results, it is proposed to extend the operations to a selected group of villages. In one house in Bijapur town, all rats and fleas were destroyed, not only in the three rooms directly fumigated but those in the fourth room having free communication with one of these rooms. In another room, which was shut off from the fumigated rooms by a small door, about half of the rats escaped and 10 dead rats and a dead lizard were found to have fallen from the roof. In another part of the same town, where grain godowns are situated, 503 houses containing 2,233 rat burrows were fumigated and here even the rats and snakes that left the burrows died after a short time.

In addition, 5,300 pounds of cyanogas dust were supplied to 16 other local bodies in British districts and Indian States, but the results obtained are not yet known.

Punjab.—With a view to the adoption of cyanogas for the destruction of rats and fleas in infected areas in lieu of, or as an auxiliary to, *bhoosa-battis*, preliminary experiments were conducted with cyanogas dust 'A' both in artificial and natural rat holes, in the fields as well as in houses. It was found that the minimum period of exposure to the gas required was 2 minutes. The following conclusions were recorded:—

(i) Experiments carried out with *bhoosa-battis* in the Punjab Epidemiological Bureau in 1926 indicated that the lethal range of the smoke did not extend beyond 10 feet for the rats and 5 feet for the rat fleas. On the other hand, with cyanogas the range of destruction for both rats and rat fleas has been found to extend to a distance of 15 feet from the mouth of the rat hole.

(ii) About one in eight of the *bhoosa-battis* were extinguished soon after the rat holes were closed with mud and consequently failed to destroy the inmates. There is no such difficulty in the case of cyanogas.

(iii) *Bhoosa-battis* are harmless to human beings but cyanogas with a low diffusive power should not be a source of danger if it is handled by a competent staff. Moreover if doors are left open, only a small concentration of the gas is retained in the air of the room and within 2 hours after the house is opened up only slight traces of the gas are left.

Burma.—Fumigation with cyanogas was begun in October 1934, and so far outfits have been obtained by 37 municipalities, 19 district councils and 7 other institutions and 1,265 pounds of the fumigant have been purchased. It is not possible to give definite results as yet but the degree of success has apparently varied in different localities. In the town of Mandalay, this new method of killing rats and their fleas has been a pronounced success, plague deaths having totalled only 14 during the last plague season as against an average mortality of 739.

Smallpox.—During 1933, over a quarter of a million cases of smallpox were recorded with nearly 104,000 deaths. These figures are the highest for several years past and, considered apart from the influence of preventive measures, indicate that like the other great epidemic diseases of India smallpox continues to adhere

to a long-wave cycle which has a fairly regular periodicity. In Bihar and Orissa which had severe epidemics during 1925 to 1927, the present cyclic increase was anticipated a year in advance and the Director of Public Health explains the increased mortality in the following words:—

'It is a known fact that vaccination prevents and limits outbreaks of smallpox, but still the rate of mortality from this cause tends to show sharp rises at times in this province. This is due to the fact that a large number of children escape even primary vaccination and thus remain unprotected. Besides, the immunity conferred by vaccination gradually declines with the passage of time, with the result that protection passes off within 6 to 7 years'.

This explanation seems applicable to other parts of India as the 1933 epidemic was widespread and of the total recorded deaths, 16,936, or over 16 per cent, occurred amongst infants and 27,390, or over 26 per cent, amongst children between 1 and 10 years. But there were exceptions and it is probable that these areas which escaped during 1933 will record epidemic outbreaks during 1934 and 1935.

With the exceptions of the Central Provinces and the two outlying provinces of Assam and Burma, every province reported a higher incidence and in Delhi, Bihar and Orissa and Ajmer-Merwara the increases were marked. In Delhi province, over 90 per cent of the smallpox deaths occurred among children under 10 years of age, which fact certainly reveals defects in revaccination work; probably the same may be said of Ajmer-Merwara. The North-West Frontier Province and the Punjab were less severely infected but in the former the death rate was 7 times the quinquennial mean and in the latter it was nearly double that mean. The Presidencies of Madras and Bengal each recorded twice the number of deaths registered during the previous year and Bombay Presidency had almost three times as many as in 1932. These are decidedly disquieting figures, even taking into account the cyclic periodicity of the disease and it is to be hoped they have acted as a spur to the health departments concerned in their preventive efforts. They should also have provided due warning to provinces like the Central Provinces and Assam which have so far escaped from the present epidemic, for the portents are that these areas will later suffer unless active steps have been taken to push both vaccinations and revaccinations.

It may be of advantage to individual health officers and others to note here some of the more apparent factors which go to discount preventive campaigns against smallpox in this country. Even where notification is compulsory it is not properly enforced; the loss of time involved inevitably postpones adoption of preventive measures which require prompt application if isolated outbreaks are not to assume epidemic proportions. On the other hand, where early notification has been made, outbreaks have been quickly and successfully controlled. Again, large numbers of children remain unprotected because of defective registration of births and because in nearly all rural areas and even in many urban areas vaccination has not been made compulsory. The first of these handicaps has been reduced considerably during recent years and it is to be hoped will soon disappear. The second is a matter which should be the concern of every officer engaged in public health work and can only be removed by patient and continued educational activities. Again, revaccination is not compulsory except in a few centres and as a result many individuals are never vaccinated after infancy. The acceptance of this preventive measure can only be achieved by propaganda suited to the populations which it is meant to influence. Lastly, isolation of smallpox cases is hardly ever practised because there are few infectious diseases hospitals in existence and because, even if there were, existing legislation is very defective and public opinion is non-existent as to the desirability of isolation. These are

all severe handicaps to those engaged in the campaign against smallpox, but all are capable of reduction if the health officers concerned constantly keep them in mind and use every available opportunity to rouse the public conscience. It may be admitted at once that this task is a difficult one: it is however not impossible as the progress already made in certain provinces during the past decade has shown.

[This report which is the most important one we receive is much too long to abstract completely in a single issue of the *Gazette*, so it is proposed to continue it in the next issue.]

REPORT ON THE PUBLIC HEALTH AND SANITARY ADMINISTRATION OF THE CITY OF RANGOON FOR THE YEAR 1934

THE death rate of the year (23.66) was slightly higher than that (22.11) of 1933 but lower than the quinquennial mean (25.93) and the mean of the last decade (29.92).

The number of deaths from smallpox (75) was higher than that (14) of the previous year but lower than the average (190) of the last ten years. Four deaths were registered from cholera as against 5 in 1933, the average number of deaths for the last ten years being 61. Plague accounted for 27 deaths as compared with 9 deaths in the previous year and 198 average deaths during the last ten years. There were 4 deaths from cerebro-spinal meningitis as compared with 1 during 1933. The average number of deaths from this disease during the last ten years was 8.

The number of typhus fever cases reported during the year was 8 without any deaths as against 1 case reported during 1933. In the past such cases were missed and diagnosed as typhoid, paratyphoid and pyrexias of uncertain origin, but, owing to the more frequent use of the laboratory for purposes of diagnosis, the existence of this fever is being detected now.

Eighty-three deaths were attributed to beri-beri which caused 75 deaths in the previous year, the average number of deaths during the last ten years being 84.

This disease was mostly confined to people of the labouring classes who were either unemployed or had uncertain incomes owing to the depressed state of the various trades and industries.

Five hundred and eight deaths were due to diarrhoea and dysentery which caused 458 deaths in 1933, the average number of deaths during the last ten years being 914. The areas most commonly affected were those that had inadequate water supply and were unsewered. The necessity of piped water supply in adequate quantities and the extension of the sewerage system in such areas is only too evident.

Enteric fever accounted for 46 deaths as compared with 52 in 1933. The average number of deaths during the last ten years was 65.

The number of deaths from tuberculosis was 831 as against 817 in 1933, the average of the last ten years being 923. During the last five years 3,760 deaths occurred from pulmonary tuberculosis as against 4,734 of the previous five years. There is, however, no doubt of the fact that the mortality from this disease is a very disquieting feature, in the state of the public health of the city.

The infantile mortality rate (270.81) although higher than that of the last year (257.03) was lower than the quinquennial mean (283.27). The loss of more than one-fourth of the infants born in the town before they even attain the age of a year can never be looked upon as satisfactory in any community and requires the concerted activities of all—not only of those charged with the improvement of the public health of the city but of all social workers. With a view to reducing the high rate of infantile mortality prevailing at present, the system of work under the maternity and child welfare scheme has been overhauled and the number of health visitors raised from 6 to 15. It is hoped that the newly-started health school will increase the supply of trained persons available for this work. Four thousand and twenty-three or 41.10 per cent of the total confinements were still attended by unqualified women and the need for the free provision of midwives in the outlying parts of the town where poor people live is very great.

Service Notes

APPOINTMENTS AND TRANSFERS

BREVET-COLONEL H. H. THORBURN, C.I.E., is appointed to officiate as Inspector-General, Civil Hospitals and Prisons, North-West Frontier Province, with effect from the 30th September, 1935 (afternoon), *vice* Colonel C. I. Brierley, C.I.E., granted leave preparatory to retirement.

The services of Lieutenant-Colonel G. H. Mahony are placed temporarily at the disposal of the Government of Bihar and Orissa, with effect from the 9th October, 1935.

Lieutenant-Colonel R. F. D. MacGregor, M.C., an Agency Surgeon, on return from leave, is posted as Residency Surgeon, Hyderabad, with effect from the forenoon of the 19th October, 1935.

Lieutenant-Colonel C. Newcomb, Principal and Professor, Medical College, Madras, is appointed to officiate as Surgeon-General with the Government of Madras, with effect from the 29th October, 1935 (afternoon), *vice* Major-General Sir Frank P. Connor, Kt., D.S.O., appointed to officiate as Director-General, Indian Medical Service.

Lieutenant-Colonel C. A. Godson made over charge of the Hooghly Jail to Major J. C. Drummond on the afternoon of the 14th November, 1935.

The services of Major F. R. W. K. Allen are placed permanently at the disposal of the Government of the Central Provinces, with effect from the 17th May, 1935.

Major J. J. Rooney, an Agency Surgeon, on return from leave, resumed charge of his appointment of Residency Surgeon, Bushire, with effect from the forenoon of the 18th October, 1935.

Major J. S. Galvin, on relief, to be Civil Surgeon, Belgaum, pending further orders, *vice* Rao Bahadur V. B. Gokhale.

Major H. Williamson, O.B.E., an Agency Surgeon, is posted as Civil Surgeon, Sibi and Loralai, with effect from the forenoon of the 29th October, 1935.

The services of Major J. R. Katariya, formerly Superintendent, Presidency Jail, are replaced at the disposal of the Government of India, Army Department, for military duty, with effect from the 1st September, 1935.

This cancels previous notification.

Captain H. S. Waters to be Presidency Surgeon, Bombay, with attached duties on his reversion from the Government of India, *vice* Major J. S. Galvin.

Captain B. S. Sandhu is appointed to act as Superintendent of the Presidency Jail, with effect from the 1st September, 1935, *vice* Major J. R. Katariya reverted to the Military Department.

This cancels previous notification.

LEAVE

Lieutenant-Colonel W. P. Hogg, D.S.O., M.C., an Agency Surgeon, is granted 7 months' leave, with effect from the afternoon of the 11th September, 1935.

Major S. L. Patney, Superintendent, Dacca Central Jail, is allowed leave for 8 months, with effect from the 2nd December, 1935, or any subsequent date on which he may be relieved.

PROMOTIONS

Lieutenant-Colonels to be Colonels

C. E. Palmer. Dated 15th February, 1935, with seniority 1st March, 1929.

W. J. Powell, C.I.E. Dated 14th August, 1935, with seniority 1st March, 1929.

Majors to be Lieutenant-Colonels

R. A. Logan. Dated 1st October, 1935.

F. M. Kirwan. Dated 11th October, 1935.

R. C. Phelps. Dated 28th October, 1935.

Captain to be Major

R. A. Wesson. Dated 30th October, 1935.

Captains to be Majors (provisional)

K. S. Fitch. Dated 13th October, 1935.

S. C. H. Worseldine. Dated 14th October, 1935.

RETIREMENT

Lieutenant-Colonel C. A. Godson, M.C. Dated 15th November, 1935.

RELINQUISHMENT OF TEMPORARY COMMISSIONS

Captain L. D. Sarronwala. Dated 1st September, 1935.

Captain M. N. Pai. Dated 16th September, 1935.

Captain T. R. R. Pai. Dated 26th September, 1935.

Notes

ARTIFICIAL LIMBS

Loss of a limb is a much more serious thing in this country than in many European countries, as not only has the cost of the artificial limb to be considered, but hitherto the difficulty of getting one that fits properly has constituted an almost insuperable problem.

There is properly no artificial leg made anywhere in the world that has such an established reputation as the Desoutter leg. The manufacturers have overcome the difficulty of supplying this limb to residents in far countries, such as India, by preparing a most elaborate, but apparently completely fool-proof, chart for taking exact measurements of the stump and normal leg, to ensure correct fitting.

We have personal knowledge of more than one Desoutter artificial leg that has been in use for many years in Bengal; these limbs have stood up very well against this extremely trying climate, so that no fears need be entertained on this account.

On the general use of these limbs we give an extract from the *Lancet* that we hope may interest readers:—

A new artificial leg for above-knee amputations has been demonstrated to us by a wearer of the appliance. The limb is the invention of Mr. Charles Desoutter, of the firm of Desoutter Bros., and appears to mark a real advance in prosthetics. A new system of construction has been used, the limb being made from seamless pressings solid-drawn from a flat sheet of 'alclad', a trade name for duralumin coated with pure aluminium. The shin from the knee to the ankle is of one piece, and the thigh from the knee to the crutch also consists of one seamless pressing, and the result is an apparatus which combines strength with remarkable lightness. The limb only weighs $3\frac{1}{2}$ to 4 lb.

To the orthopaedist the point of greatest interest is the knee-mechanism, which so controls the swinging speed and action of the joint as to make the walking natural. The loose and pendulous swing, which is a notable feature of a heavy artificial limb, was absent from the gait of the one-legged man who paraded before us; he was an above-knee amputee with a stump approximately $9\frac{1}{2}$ inches long. The half bending jerky knee action typical of the knee control of many of the artificial limbs that found their way on the market after the war was entirely absent.

A notched control wheel is sunk flush in the knee and is easily rotated with slight thumb pressure through the clothing. The shape and natural appearance of the appliance are due to the absence of outside straps and elastics, the pelvic band affording sufficient support. The wearer during the demonstration first walked with the knee control out of action, when the artificial nature of his limb was obvious; but on turning the control wheel his gait became natural, when he said that he

could now walk much faster. The easy action has been arrived at by mounting the wheel on a minute ball-bearing thrust race. The spring is a sort of artificial quadriceps, and the action gradually weakens as the leg flexes, becoming neutral in the sitting position.

A film in slow motion prepared by the firm shows well the leg action of a normal person walking, and discloses that in taking a step forward with natural gait the leg starts its bend and swing comparatively slowly, not rising high from the ground. But in coming forward acceleration occurs until the step is complete. In this film two men are shown walking side by side, one of whom has two legs, while the other has lost a leg above the knee. It needs an expert eye to discern any difference.

Medical men may obtain literature charts, etc., post free on application to the office of this journal.

LIVER PREPARATIONS

Livogen

It is at the present time the 'fashion' to prescribe liver for almost any condition in which anæmia is a prominent feature, and for many in which it is not. Though we deprecate the indiscriminate prescribing of liver, nevertheless we have to admit that in few conditions does it do any harm and in a great variety of conditions it is of real value, whether by virtue of its iron content, its high protein value, its vitamin content, or the presence of the specific hæmopoietic factor.

A very attractive liver preparation is put up by British Drug Houses, Limited, in the form of Livogen. This preparation not only contains liver extract with all its numerous hæmopoietic and nutritional factors, but in addition a concentrated extract of yeast with its associated vitamin B (complex), and additional iron in the form of hæmoglobin.

This preparation should be of great value when liver is prescribed for conditions other than those in which the specific hæmopoietic factor only is required, that is to say, for 99 per cent of the conditions for which liver is usually prescribed in this country.

Livader

This is a concentrated liquid extract of liver which is guaranteed to conform with the specification for *extractum hepatis liquidum* B. P. 1932; it contains the whole of those effective anti-anæmic principles of liver the administration of which causes a rise in the percentage of reticulocytes and the restoration of the blood picture to normal in persons suffering from pernicious anæmia and from other anæmias associated with megaloblastic hyperplasia of the bone marrow.

One fluid ounce (about 30 c.cm.)—an average daily dose—contains the whole of the hæmopoietic principles of half a pound of fresh liver.

Livadex is administered orally; it may be taken by the spoonful, or it may be sipped undiluted from a wineglass. If desired it may be diluted with its own volume of hot or cold water, but usually it is found to be more palatable undiluted.

The usual daily requirement is one fluid ounce, or two tablespoonfuls, until the normal blood picture is restored, after which time a maintenance dose of one tablespoonful daily is generally sufficient.

Liver Extract B. D. H.

Liver Extract B. D. H. (for intramuscular injection) contains the anti-anæmic principles of liver free from protein; it is in such a state of purity that its injection—intramuscularly or intravenously—produces a quick response without serious depressor effects or other objectionable sequelæ. It is remarkably active, 1 c.cm. containing the pernicious anemia fraction obtained from 35 to 50 grammes of fresh liver.

The intramuscular injection of liver extract is at least thirty times as effective as the oral administration of an equal quantity of extract. Two cubic centimetres of Liver Extract B. D. H., parenterally administered, therefore, is equivalent in effect to the oral administration of over 500 grammes of fresh liver; its injection daily produces a satisfactory response within three or four days, by which time the patient usually is recovered sufficiently to revert to oral treatment with Livadex, if desired. The injection of an appropriate dose at regular intervals, or of a larger dose at more extended intervals, will ensure the continuance of normality.

JAIL FOR SALE OF SPURIOUS DRUG

'I feel that the public need to be protected from such heartless exploitation of the sick and the injured'. With this remark Mr. Oscar H. Brown, Presidency Magistrate, Bombay, passed a sentence of one month's rigorous imprisonment and a fine of Rs. 250 on an employee of a stationery firm, on a charge of selling a spurious 'Antiphlogistine'.

'The accused', the Magistrate further commented, 'exploited a well-known drug which is largely used by the medical profession and known even by laymen simply by the name. In cases of dangerous illness incalculable harm may be done by the use of a drug which is not as efficacious as the one prescribed by a doctor'.

In default of fine the accused was ordered to undergo further imprisonment for three months.

THE MODERN ANTISEPTIC

'DETTOL' is now available to doctors in India.

This antiseptic has become widely adopted by hospitals and doctors throughout the United Kingdom although it was introduced only 2½ years ago. The reason for this is not far to seek.

The government report on maternal mortality and morbidity in 1932 stated that the antiseptics then in use left a great deal to be desired and apart from 2 per cent aqueous iodine nothing could be relied upon to effect complete destruction of hæmolytic streptococci on the skin, and to remain an effective germicide when dried.

Soon afterwards, Messrs. Reckitt and Sons, Limited of Hull introduced 'Dettol' and subsequent research at the Bernhard Baron Research Laboratories showed that undiluted Dettol, like 2 per cent aqueous iodine, was able completely to destroy hæmolytic streptococci on

the hands, and to render them insusceptible to reinfection by hæmolytic streptococci for at least two hours afterwards; unlike iodine, however, Dettol was clean in use and painless in application besides being pleasant smelling. Also a 2 per cent solution of Dettol was able to kill hæmolytic streptococci in two minutes in a 50 per cent solution of pus and blood—a definite advance on iodine which, being unstable in the presence of blood and pus, was suitable only for simple skin sterilization. Dettol was, therefore, particularly suitable for general cleaning as well.

The full report appeared in *The Journal of Obstetrics and Gynaecology of the British Empire* (XX, 966), and further details were given during a speech at the British Medical Association Meeting in Dublin.

In *Queen Charlotte's Quarterly* for February 1935 it is now shown that consequent upon the introduction of Dettol into the labour wards there was a sharp drop in the sepsis rate. Reports of reductions elsewhere, even on a considerable scale, are being received by the manufacturers.

Dettol is three times as effective a germicide as pure carbolic acid (Rideal-Walker test), and being non-corrosive and non-toxic it can be used at highly effective concentrations. These qualities, in addition to its stability, render it of particular value in wound treatment and general surgical applications.

Dettol is now available in India, as it has been placed on the market through Messrs. Atlantis (East), Limited, 20/21, Chetla Road, Calcutta.

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Original Articles

BACTERIOPHAGE IN THE TREATMENT OF CHOLERA

By C. L. PASRICHA, M.A., M.B., B.Chir., M.R.C.S., L.R.C.P.
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and

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Research Worker under the Indian Research Fund Association

(An enquiry at the School of Tropical Medicine, Calcutta, financed by the Indian Research Fund Association)

BACTERIOPHAGE is an agent that has already been used extensively, in both the prophylaxis and treatment of certain bacterial infections and there is every indication that its use is being considerably extended. Not only is bacteriophage popular with the medical profession who advocate it on account of the ease of its administration, but in many cases patients swallow the contents of bacteriophage ampoules on their own initiative without any medical advice.

There is a general impression that here at last is an agent that can be safely administered, that is harmless to the tissues of the host, and that can destroy bacteria and in doing so reproduces itself a millionfold. The idea is so attractive and so exceedingly simple; added to this, are the emphatic claims made by d'Herelle for bacteriophage as a natural agent in the cure of disease and a most valuable therapeutic agent in the hands of the physician. With bacteriophage, d'Herelle claims to have treated successfully cases of cholera, dysentery, and plague, and in the field to have controlled and stamped out epidemics of these diseases.

A voluminous literature has grown up on the practical application of bacteriophage. This literature contains reports and records of experiments and trials. Except for the reports of d'Herelle and his followers, almost all of which claim uniformly successful results, many of these are both disappointing and contradictory. It is necessary, therefore, that, in a country such as India where diseases exist in which, if we accept d'Herelle's contentions, bacteriophage is the ideal method of treatment, we should examine very critically the results obtained in the use of bacteriophage.

In this present communication we shall confine ourselves to the use of bacteriophage in the treatment of cholera.

A review of the literature of the use of bacteriophage in the treatment of cholera reveals that the evidence is for the most part contradictory. d'Herelle, Malone and Lahiri

(1930) reported dramatic success in the treatment of cholera with bacteriophage. These workers recorded a mortality of 8.1 per cent amongst bacteriophage-treated cases (74 cases) as compared with a mortality of 62.9 per cent in untreated cases (124 cases). Further, analysis of the value of bacteriophage according to the time of administration after the onset of symptoms showed that, when bacteriophage is administered within six hours of the onset of symptoms, there was no mortality (26 cases), that, when the administration of bacteriophage was between six to 24 hours, the mortality was 10.2 per cent (41 cases), and that in seven cases in which bacteriophage was administered after more than 24 hours there was a mortality of 14.3 per cent. These workers also stressed the importance of its administration by mouth only, and said that bacteriophage must never be given to the patient by the subcutaneous route. These experiments were carried out under primitive conditions in villages, and the amount of bacteriophage employed in the majority of instances was 6 c.cm. per case.

Morison and Vardon (1929) reported the results of a small outbreak of cholera in which they treated 31 cases with bacteriophage with a mortality of 29 per cent, as compared with a mortality of 75.8 per cent amongst 29 cases receiving no bacteriophage. More recently, Morison, Rice and Choudhury (1934) analysed in detail the results obtained by them in their experiments with bacteriophage in the field extending over a number of years. These trials were also carried out under primitive village conditions and the majority of cases received only 2 c.cm. of bacteriophage by the mouth. Under the conditions of the experiment which was spread over a number of villages, these workers found it impossible to maintain alternate case controls. They made exhaustive and detailed comparisons as regards age, sex, caste and the period in the epidemic in which the cases occurred, and found that amongst 1,007 cases of cholera studied in the field in two epidemics, 364 phage-treated cases had a mortality of approximately 50 per cent of that of the untreated cases.

Of other favourable reports of the value of bacteriophage as a therapeutic agent under field conditions, mention may be made of the extensive trials of Asheshov (1931 and 1932) and the Director of Public Health, Bihar and Orissa (1933, 1934 and 1935).

King (1934) also reported favourable results in the treatment of a small series of cases. This investigator stresses the difficulty in comparing the phaged cases with unphaged cases in the mass owing to the greater attention being paid in the collection of data from the phaged area than from the control non-phaged area. He also draws attention to the enthusiasm in officers and health inspectors as an important factor which may influence the collection of figures.

Although the many reports of good results from the use of bacteriophage in the treatment of cholera under field conditions make it difficult to assert that bacteriophage is without effect in treatment of the disease, it is still more difficult in the absence of adequate controls to arrive at an unequivocal verdict in favour of the therapeutic value of bacteriophage.

Of the reported trials of bacteriophage therapy in any extensive series of cholera cases under hospital conditions, we are aware of only four experiments. Ross, Bagchi and Roy (1928) report the results of treatment in hospital of 16 cases with choleraeophage of which only two died as against three deaths out of seven treated otherwise. The authors claimed no statistical validity for the results.

Taylor, Greval and Thant (1930) using a bacteriophage of high activity observed a mortality of 57 per cent in 14 treated cases of bacteriologically-proven cholera compared to a mortality of 53 per cent in a series of 19 similar cases not treated with bacteriophage. Alternate cases were treated. The stools were examined for the presence of bacteriophage and in the great majority of cases in which recoveries occurred these workers found no evidence of bacteriophage in the stools active against the patients' own vibrios. These investigators concluded that bacteriophage is not an essential agent of recovery and that its administration was not an effective therapeutic measure in the class of case dealt with.

This was the first serious report against the therapeutic use of choleraeophage. In this connection reference might also be made to Souchard (1930) who attempted to confirm the work of d'Herelle. This author used a bacteriophage supplied by d'Herelle, prepared it in the same way and administered it in doses recommended by d'Herelle but failed to obtain similar results. The mortality in a group of 27 treated cases was 87 per cent, only three recoveries being obtained. This mortality was identical with the prevailing mortality in untreated cases at the same time in the same locality.

Asheshov, Khan and Lahiri (1930 and 1931) treated 266 cases of cholera in the cholera wards of the Patna Medical College Hospital and obtained a gross mortality of 7 per cent in 140 bacteriologically-proven cholera cases. These workers had no parallel series of control cases and give as control figures the mortality rate in the same hospital before the introduction of bacteriophage. These control figures were 21 per cent gross mortality and 25 per cent in the bacteriologically-proven cases. The bacteriophage was given undiluted in about one-drachm doses every half hour for the first 16 hours and later a bottle containing 50 c.cm. of phage was given daily for two days. For more rapid action, these workers advocated the use of bacteriophage intravenously in 5 c.cm. doses, considerably diluted and best administered along

with the salt solution. There was considerable selection of cases in the phage-treated series, and the control non-phaged series of only 24 cases was in a different period of the epidemic, so that, when it is remembered that the mortality in cholera varies very considerably in different periods of the epidemic, much of the value of the arguments advanced is lost.

Harvey (1933) gives an excellent review of the literature on choleraeophage, and, after a critical survey of the published reports dealing with the practical application of choleraeophage, concludes:—'Bacteriophage prophylaxis and therapy have made greater advances in cholera than in plague. Much of the work with both these diseases, however, is confusing, contradictory and uncontrolled, whilst failure of prophylactic or therapeutic action of the bacteriophage is apt to be accompanied by an *apologia* that is complicated and not convincing. We may hope that the trials in cholera at present progressing will afford the evidence of complete and permanent suppression of its epidemic character. None the less we are of opinion that proof of favourable action, unless dramatic and continued, is most likely to be obtained by the comparison of cases alternately treated with and without phage. In view of the conflicting opinions which are prevalent regarding the living virus-nature of the bacteriophage, the only judgment, which seems to us possible on this question, is one of non-proven'.

In 1933, we (Pasricha, 1934) carried out an experiment to evaluate bacteriophage in the treatment of cholera. Two wards were set apart in the Campbell Hospital for cholera cases, and the admission of cases was alternately into the two wards. The treatment in the two wards was identical except that in one bacteriophage was used in addition to the usual treatment of cholera. Bacteriophage used was constantly 'refreshed' by passage with vibrios isolated during the different phases of the epidemic and was given mainly by the mouth. In 50 cases choleraeophage was given intravenously and gave us satisfactory results. A very brief summary of the results of this experiment is abstracted from the *Annual Report of the School of Tropical Medicine*, 1933.

TABLE I

The number of clinical cases of cholera treated with choleraeophage and number not treated with choleraeophage with the total deaths in the two series

	Treated with choleraeophage	Not treated with choleraeophage
Total number of clinical cases of cholera investigated.	290	180
Number of deaths irrespective of cause.	42 or 14.5%	40 or 22.2%

TABLE II
Summary of the bacteriological findings of the two series with the number of deaths in the different groups of cases

	TREATED WITH CHOLERAPHAGE (TOTAL 290)		NOT TREATED WITH CHOLERA- PHAGE (TOTAL 180)	
	Total number	Deaths	Total number	Deaths
1. Number of cases in which agglutinating vibrios (either alone or together with non-agglutinating vibrios) were isolated.	170	18 or 10.6%	103	20 or 19.4%
2. Number of cases in which non-agglutinating vibrios only were isolated.	33	3 or 9.1%	9	1 or 11.1%
3. Number of cases in which no vibrios were isolated.	87	21 or 24.1%	68	19 or 28.0%

The results obtained corroborate to a certain extent the evidence deduced by other workers on the value of cholera-phage in the treatment of cholera, but are neither as dramatic nor as convincing as some of the earlier recorded results.

The present experiment

This experiment might be considered as a continuation of the experiment in 1933. The experience gained then, when we studied 470 cases of cholera in the course of two months during the height of the cholera epidemic, was invaluable in planning the present enquiry. It was realized that for an intelligent application of bacteriophage therapy, a close co-operation between the clinician and the laboratory was essential and for this purpose one of us (E. G. O'F.) was made personally responsible for the collection of specimens from patients, the administration of bacteriophage, and the collection of data.

During the year ending 30th July, 1935, 1,369 cases admitted into the cholera wards of the Campbell Hospital were investigated. Of these 684 were treated with cholera-phage and 685 were not treated with cholera-phage. The selection in the two series was made by taking alternate admissions into the wards, irrespective of age, severities and general condition of the patient. Both series received the usual hospital routine treatment for cholera, the phage-treated cases received in addition cholera-phage in doses of 2 c.cm. every four hours. Except for the period 1st April, 1935 to 31st May, 1935, during the height of the cholera epidemic when two wards were available for cholera cases, the experiment was conducted in one ward.

The usual hospital treatment is so well known that it is not necessary to give details of it here. The only medication given by the mouth was in the form of divided doses of calomel. In order to determine whether these doses of calomel had any deleterious effects on bacteriophage administered by the mouth, we examined the stools of a number of cases and found no significant difference between those that had and had not taken calomel. Every case was

examined bacteriologically on the day of admission, or, if admitted during the night, the next morning. Later, examinations were made at least once in every 24 hours, up to the complete disappearance of symptoms and when possible a certain number of cases were followed up after discharge from hospital. Special efforts were made to examine repeatedly those cases clinically cholera but bacteriologically negative. Specimens from patients were collected in the majority of cases with the aid of our special catheter outfits, so as to ensure freedom from any extraneous contamination. In addition to the direct plating by the bed-side, the peptone water enrichment method was also employed.

Cholera-phage used for treatment was prepared on freshly-isolated agglutinable strains. It was realized that uncontrolled and haphazard application of stock bacteriophage prepared on one set of vibrios could not be expected to yield any conclusive results. Our therapeutic cholera-phage was therefore constantly 'refreshed' on recently-isolated vibrios. Freshly-isolated potent phages were frequently added to the 'seed phages' and every effort was made to

TABLE III
Analysis of the 1,369 cases of cholera studied during the year ending 30th July, 1935. The number of cases clinically cholera, treated and not treated with bacteriophage, and the gross mortality in the two series irrespective of cause of death

	Treated with cholera-phage	Not treated with cholera-phage
Total number of cases clinically cholera.	684	685
Total number of deaths irrespective of the actual cause of death.	92	114
Percentage mortality	13.5	16.6

ensure the presence of a larger number of types of cholera-phage in each brew. This last often necessitated the addition of some of the types separately. The results have been analysed, and a brief summary of the bacteriological findings of the cases treated and not treated with cholera-phage, and the mortality in the two series is given in tabular form.

TABLE IIIa

Analysis of cases admitted to the cholera wards of the Campbell Hospital from the 1st April, 1935 to the 31st May, 1935, when there were separate phage and non-phage wards

Number of cases clinically cholera, treated and not treated with bacteriophage, and the gross mortality in the two series irrespective of cause of death.

	Treated with cholera-phage	Not treated with cholera-phage
Total number of cases studied	209	220
Total number of deaths irrespective of cause of death.	34	53
Percentage mortality ..	16.2	24.1

The only criterion of the results of treatment employed in these and subsequent tables has been recovery or death. Whether the patient was admitted dying or died within a few hours, or whether death occurred from other causes than cholera has not been taken into consideration. We have not excluded a single case. All cases are taken as cholera and all deaths as due to cholera. There is no selection of cases.

When we examine the results we find that the gross mortality is less, though not statistically significant, in the phage-treated series. Further, that the difference in the mortality rates between the phage-treated and control series is more marked during the period when the phage-treated cases were in a separate ward. There is suggestive evidence to support d'Herelle's opinion that therapeutic bacteriophage administered to a patient in a ward rapidly spreads throughout the ward. In fact d'Herelle expressed the opinion that no crucial experiment as to the efficacy of bacteriophage could be carried out except in places where arrangements could be made to isolate rigidly every case so as to prevent the spread of phages from one case to the other. Such experimental conditions would be difficult to obtain in India and it would be difficult to deal with a large number of cases.

It will also be noted that the mortality in both the phage-treated and control series is higher in the second group. This is undoubtedly due to the increased mortality rate at the height of the epidemic.

When we group the cases according to the results of bacteriological findings we observe significant differences in the mortality in the phage-treated and control series.

TABLE IV

Analysis of the total number of cases in whom vibrios (agglutinable or inagglutinable) were isolated and the mortality in the phage-treated and control series

	Treated with cholera-phage	Not treated with cholera-phage
Number of cases passing vibrios.	398	443
Percentage of vibrio-positive cases.	58.2	64.7
Number of cases passing vibrios that died irrespective of the actual cause of death.	33	79
Percentage mortality ..	8.3	17.8

TABLE IVa

Analysis of the number of cases (during the period of separate phage and non-phage wards) in whom vibrios (agglutinable or inagglutinable) were isolated and the mortality in the phage-treated and control series

	Treated with cholera-phage	Not treated with cholera-phage
Number of cases passing vibrios.	150	166
Percentage of vibrio-positive cases.	71.8	75.5
Number of cases passing vibrios that died irrespective of the cause of death.	15	37
Percentage mortality ..	10	22.3

The difference in the percentage mortality in the phage-treated and non-phage-treated series is more marked and is statistically significant in both group of figures. It can be reasonably held that cases in which we were not able to find any vibrios were also cholera, but this does not, we think, vitiate the significance of these figures. No attempt has been made to select cases and the same care and attention was paid in the examination of both series of cases. It will be noted that, whereas in the total number of cases we found vibrios in 60 to 65 per cent of the cases, in the cases during the height of the epidemic the number of cases in which

vibrios were found was 72 to 76 per cent. The actual number of cases in which vibrios were found are large enough to justify the statistical conclusions.

We can reasonably conclude that in cases of clinical cholera in which we were able to isolate

vibrios, bacteriophage is of definite therapeutic value. If we analyse this group of cases passing vibrios according to the types of vibrios isolated, we obtain a still better contrast between the phage-treated and the control series.

TABLE V

The total series

The frequency of agglutinable and inagglutinable vibrios in the bacteriophage-treated and control series, together with the number and percentage of deaths in each group.

Type of case	TREATED WITH CHOLERAPHAGE			NOT TREATED WITH CHOLERAPHAGE		
	Cases	Deaths	Percentage, mortality	Cases	Deaths	Percentage, mortality
Total number of cases in whom vibrios were isolated.	398	33	8.3	443	79	17.8
Total number of cases in whom only agglutinable vibrios were isolated.	219	15	6.8	244	49	20.1
Total number of cases in whom both agglutinable and inagglutinable vibrios were isolated.	118	13	11.0	125	27	21.6
Total number of cases in whom agglutinable vibrios were isolated either alone or together with inagglutinable vibrios.	337	28	8.3	369	76	20.6
Total number of cases in whom only inagglutinable vibrios were isolated.	61	5	8.2	74	3	4.7

TABLE Va

The series of cases treated in separate phage and non-phage wards during the height of the epidemic

The frequency of agglutinable and inagglutinable vibrios in the bacteriophage-treated and control series together with the number and percentage of deaths in each group.

Type of case	TREATED WITH CHOLERAPHAGE			NOT TREATED WITH CHOLERAPHAGE		
	Cases	Deaths	Percentage, mortality	Cases	Deaths	Percentage, mortality
Total number of cases in whom vibrios were isolated.	150	15	10.0	166	37	22.3
Total number of cases in whom agglutinable vibrios only were isolated.	83	4	4.8	74	19	25.7
Total number of cases in whom agglutinable and inagglutinable vibrios were isolated.	51	8	15.7	66	15	22.7
Total number of cases in whom agglutinable vibrios were isolated either alone or together with inagglutinable vibrios.	134	12	9.0	140	34	24.3
Total number of cases in whom inagglutinable vibrios only were isolated.	16	3	18.8	26	3	11.5

Of the total number of 398 cases of cholera passing vibrios in the phage-treated series we found agglutinable vibrios in 337 cases or approximately 85 per cent of the vibrio passers. The mortality in this group is 8.3 per cent. Of the 443 cases in the non-phage series 369 cases or 83 per cent of the vibrio passers were found to pass agglutinable vibrios. The mortality in this group is 20.6 per cent. The results in this group are statistically significantly different.

In the smaller group of cases admitted during the height of the epidemic, we have a mortality of 9 per cent in the phage-treated cases passing agglutinable vibrios, either alone or together with inagglutinable vibrios, as compared to a mortality of 24.3 per cent in the non-phage series. In those cases in which we isolated agglutinable vibrios only, the difference in the rates of mortality is even more marked, 4.8 per cent in the phage-treated series and 25.7 per cent in the non-phage series.

There is one group of cases in which phage apparently gave unfavourable results. These

are the cases in which, in spite of repeated search, we found only inagglutinable vibrios, the mortality in the phage-treated series (61 cases) being 8.2 per cent as compared with 4.7 per cent in the control series (74 cases). No satisfactory explanation can be advanced for this failure and apparent harmful effect of phage therapy as judged by the mortality rates alone. The actual number of cases are far too small to lead to any definite conclusions and the figures are not statistically significant. It must be remembered however that the cholera phage used in the experiment had been propagated on agglutinable vibrios only. The effect of bacteriophage prepared on inagglutinable vibrios, or a therapeutic phage prepared on both agglutinable and inagglutinable vibrios of a particular epidemic, still remains to be determined.

Finally, there remain a group of cases in both the phage-treated and control series in which we failed to isolate any vibrios or in which no examinations were made. The results in these groups are summarized below :—

TABLE VI

I. Total series

Number of cases in which no vibrios were isolated or in which no examinations were made and the mortality in the phage-treated and control series.

	TREATED WITH CHOLERAPHAGE			NOT TREATED WITH CHOLERAPHAGE		
	Cases	Deaths	Percentage, mortality	Cases	Deaths	Percentage, mortality
Total number of cases in whom no vibrios were isolated.	234	20	8.5	194	6	3.1
* Total number of cases not examined.	52	39	75.0	48	29	60.4

TABLE VIa

II. The series of cases treated in separate phage and non-phage wards during the height of the epidemic

Number of cases in which no vibrios were isolated or in which no examinations were made and the mortality in the phage-treated and control series.

	TREATED WITH CHOLERAPHAGE			NOT TREATED WITH CHOLERAPHAGE		
	Cases	Deaths	Percentage, mortality	Cases	Deaths	Percentage, mortality
Total number of cases in which no vibrios were isolated.	30	4	13.3	38	6	15.8
* Total number of cases not examined.	19	15	78.9	16	10	62.5

* These include all cases that were admitted and died before it was possible to collect any samples from them.

In the group of cases in which no vibrios were isolated our therapeutic bacteriophage seems to have had an unfavourable result. Clinically some 80 per cent of these cases were undoubtedly cases of cholera and this result is not understood. Further investigation of such cases is necessary before any conclusions can be drawn.

From a consideration of the results reported above it is evident that bacteriophage does not produce any dramatic effects. In our experiment to evaluate the use of bacteriophage on alternate cases of cholera we have not met with the striking results obtained by some of the previous workers. We have, however, definite evidence that bacteriophage is of value; particularly that cholera-phage, as prepared by us, acts effectively in the case of patients passing agglutinable vibrios. We have used just one criterion, the criterion of recovery or death, irrespective of the age, severity, the delay in treatment and other factors which undoubtedly

phage series than in the control series. Cases receiving phage are discharged sooner from hospital, they secrete vibrios for a smaller number of days and in general run a clinically milder course. There is less tendency to the development of pneumonia but these and other clinical conditions are not suitable for statistical analysis. The general impression of experienced workers in clinical charge of cases is that uræmia and other deadly complications are often averted, or, if they supervene, are milder in the phage-treated series. The development of uræmia is such a marked clinical feature that definite records are available. We have carefully analysed the clinical records of all cases and find that the number of patients developing uræmia in the phage-treated series is approximately half the number developing uræmia in the non-phage series. Table VII and the graph show the incidence of uræmia in cases grouped together according to the bacteriological findings.

TABLE VII

Showing the incidence of uræmia in the phage-treated and non-phage control series. The cases have been arranged in different groups according to results of the bacteriological findings

Group		TREATED WITH CHOLERAPHAGE		NOT TREATED WITH CHOLERAPHAGE	
		Number of cases	Incidence of uræmia, per cent	Number of cases	Incidence of uræmia, per cent
1	Cases in which agglutinable vibrios only were isolated.	219	12	244	33
2	Cases in which agglutinable and inagglutinable vibrios were isolated.	118	23	125	31
3	Cases in which inagglutinable vibrios only were isolated.	61	5	74	14
4	Cases in which vibrios were not isolated ..	234	5	194	10
5	Cases in whole series excluding the cases not examined.	632	11	637	23

play an important rôle in determining the issue. We have submitted cholera-phage to a very severe test and have maintained strict and adequate controls in our experiment. The results, which are based on a number of cases sufficiently large to justify the drawing of conclusions, do in our opinion indicate that the bacteriophage used by us was of definite value as a therapeutic agent, and that the reduction in the death rate is as great as one could reasonably expect in a disease that naturally runs so rapid a course and has such a high death rate.

We have analysed various other clinical data. We find that there is an appreciable difference in the phage-treated and control series of cases. The patients are less toxic, there is less dehydration and fewer 'salines' are required in the

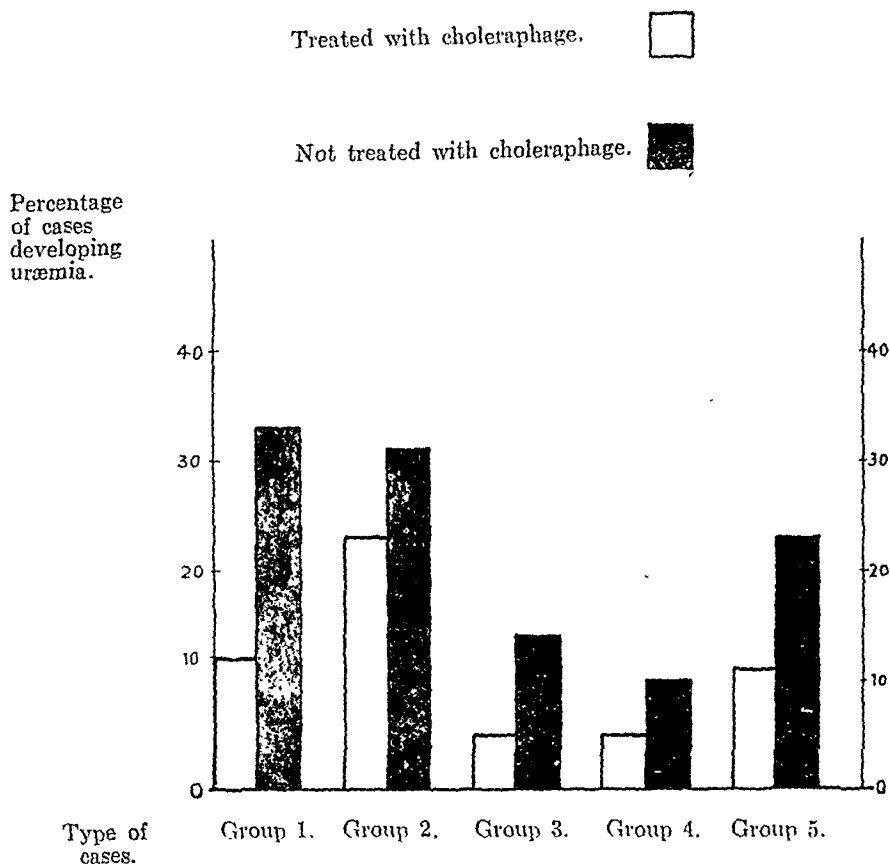
Conclusions

1. A series of 1,369 cases of cholera admitted into the cholera wards of the Campbell Hospital during the year ending 30th July, 1935, have been investigated. Of these, 684 cases were treated with specially-prepared cholera-phage and 685 were not treated with cholera-phage. This selection in the two series was made by taking alternate admissions into the wards.

2. Comparison of the results of the experiment, taking recovery or death as the sole criterion of the value of cholera-phage, shows that bacteriophage has caused a real reduction in cholera mortality in cases passing vibrios and that this reduction is more marked in those cases passing agglutinable vibrios.

GRAPH

Figures of table VII shown in graphic form.



3. There is no significant effect on cases passing inagglutinable vibrios only or in cases bacteriologically negative.

4. There is marked reduction in the incidence of uræmia in the phage-treated series.

Acknowledgments.—We are grateful to the Indian Research Fund Association for a grant which enabled us to undertake this work. We would also acknowledge the help given us by Lieut.-Col. N. C. Kapoor, I.M.S., late Superintendent of the Campbell Hospital, Dr. S. N. Choudhuri, the Resident Medical Officer, and the staff of the cholera ward. A great deal of help was asked from each member of the staff of the cholera ward of the Campbell Hospital and was most willingly and ungrudgingly given us. We are also grateful to Dr. Raja for submitting our figures to statistical analysis. Finally, we would record our great sense of loss and of sorrow at the death of Dr. A. N. Sen, teacher of infectious diseases, who for many years has given us most valuable help and whose long experience in cholera work was invaluable to us.

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AGAINST ORTHODOXIES IN RABIES

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Infectivity of the biting animal versus susceptibility of the victim

Mortality in untreated cases bitten by rabid animals is low. The following statements taken from the literature are typical:—

'Infections from rabid dogs were said to occur in 16 per cent of bitten individuals, whereas 80 per cent of cases bitten by rabid wolves are said to become infected. Inasmuch as the lesions caused by wolves are more extensive this increased infectivity may depend on the amount of virus introduced' (Horder and Mathews, 1929).

'Not all persons bitten by a rabid animal develop the disease, the site and number of bites influencing its development. About 40 per cent of dogs and 16 per cent of human beings who are exposed become infected' (Williams, 1930).

'The following estimates of mortality among the bitten and untreated have been made on various cases by different workers: Doebert—14.8, Hogyes—15, Marx—6 to 8, and Babes about 5 per cent. Figures collected at Kasauli from cases of persons who have come for treatment, but have received little benefit from it on account of late arrival, show that the percentage mortalities amongst untreated persons who have been bitten on the face, arm and leg must be greater than 9.5, 1.6 and 0.9 respectively. In dealing with such mortality figures it is well to remember that they have been calculated from large numbers of collected cases, involving large numbers of biting animals. They refer to the probability of death from the bite of an animal of average infectiveness. The infectivity of the biting animal is known to vary widely both amongst individuals and according to the stage of the disease. Thus in some cases it would appear that the biting animals are highly infective, and give rise to a mortality of 80 or 90 per cent amongst the creatures which they have bitten, whereas in others they appear to be incapable of transmitting infection at all' (Harvey and McKendrick, 1923).

With the exception of the last part of the last statement the impression created by these statements is that man is not a very susceptible subject to rabies from a rabid dog. The object of this communication is to point out that there is no justification for such an impression. At least equally possible is the assumption that the

infectivity of the rabid dog varies. Immense strength is added to the assumption by the well-known fact in experimental work that some street viruses (1st passage) are almost inert, while others are almost cent per cent lethal.

On the hypothesis of variation in infectivity the enormous difference between the average mortality of 16 per cent and the extreme mortality of '80 or 90' per cent can also be explained in terms of simple arithmetic. There must be many more viruses of 0—16 per cent mortality (= infectivity) than of 16—'80 or 90' per cent mortality (= infectivity) to give an average of 16 per cent mortality (= infectivity). In fact the majority of viruses must be non-infective, for chances of the viruses being non-infective are greater than of the human beings being so capriciously distributed with regard to susceptibility, that, though sometimes an '80 or 90' per cent infection results, on an average it is only 16 per cent. The presumption is strongly in favour of a variation in infectivity as opposed to a difference in susceptibility.

Incidentally, the fact that bites from wolves give a higher mortality figure would suggest better, more natural and original conditions for the 'maturation' of the virus in forests than in inhabited areas, if the factor of the greater severity of the bite could be controlled. The writer (Greval, 1932 and 1933) has contributed to this view in connection with rabies in the wild carnivores.

The supposed greater susceptibility of the dog may be entirely due to the fact that dogs bite dogs mostly on head and neck, parts which anatomically are better suited for the planting of the infection.

The question of susceptibility versus infectivity would hardly have arisen if it were not so difficult to obtain correct health returns of untreated and bitten cases fulfilling these two conditions: (i) The cases should fall into batches bitten by the same animal on the same day and (ii) there should be at least one death from hydrophobia in each batch. It is only by analysing batches of this kind (controlling factors of mechanical and anatomical importance) that a true susceptibility of man to hydrophobia could be worked out. As an illustration is given the following batch recorded at Kasauli:—

Locality of the incident—Jaipur (State).

Date—14th August, 1932.

Number of persons bitten—4.

Number of deaths among the untreated cases up to 15th October, 1932—3.

These are the details: Four men were bitten by the same dog on the same day; the dog was then killed; about 55 days later two of the men developed hydrophobia and died; the other two, then, started for Kasauli; arriving at Kasauli one of them, a class III case (Hempt), developed hydrophobia (after one day's treatment = no treatment) and died.

*[Note.—The publication of this paper was withheld in 1932 in deference to the opinion of the Director of the Pasteur Institute, Kasauli, who looked upon it as a criticism of the treatment given in the Institute. In the annual report of the aforesaid Institute for the year 1933-34, however, a list of serious post-treatment sequelæ has appeared (part II, p. 4). It is presumed, therefore, that the objection no longer holds.

The paper was written under two names. The name of the second writer, who did not wish to have the paper published under his name, has been omitted. Otherwise the paper is materially unaltered.]

Assuming that the fourth case, a class II case (Hempt), would not have developed the disease even without the treatment (an assumption not really justified in view of the different degrees of bites having different incubation periods) the mortality from the bite of this dog in untreated cases was 75 per cent.

Deaths from licks

'Opinion is equally divided as to the necessity of submitting to anti-rabic treatment persons whose skin has come into contact with the saliva of a rabid animal (or human being suffering from hydrophobia), if there be no visible break in the continuity of the skin surface'.

Resolution II, 4, of the International Rabies Conference, League of Nations (1927).

The common practice in India is not to advise treatment for licks if there are no apparent skin lesions. The following military case is quoted :

Lieutenant A., aged 26.

Previous history: His dog died of rabies some six weeks ago. States that on the occasion the dog caught hold of his forearm in its mouth but there was no abrasion on the skin. No anti-rabic treatment given.

History of malaria, August 1931: First felt unwell 20th August, 1932, when he experienced pain and hyperæsthesia of his right forearm and also felt tired. Bitten four times by wasps few days ago. On 21st August, 1932, he was still off colour and had a slight rise of temperature. He read up the symptoms of rabies and reported sick on 22nd August, 1932.

Present condition: Complains of being tired and of very slight discomfort in his right forearm. Is very anxious and when being examined collapsed and vomited. On being given a glass of water he found difficulty in swallowing, and gasped for breath. Heart shows a mitral murmur when patient is sleeping (lying?). Sound normal when erect. Temperature, 99.6°F. Respiration, 18. Pulse, 72. No headache or other symptoms. History and condition give rise to the suspicion of hydrophobia.

Later: Patient seems more comfortable. Vomited. [Bromide and chloral given.]

23rd August, 1932. Patient did not sleep well. Vomited his sedative. He is still very anxious, but has some control over his dysphagia. [Bromide and opium given per rectum.]

5 p.m. Patient is much better and has slept. His improvement may be due to the effect of his sedative not having worn off: or it may be genuine improvement.

7-30 p.m. Patient is not so well. His irritability is increased.

9 p.m. Patient is worse and appears to be definitely suffering from rabies. His saliva is rejected, his buccal muscles are working and his irritability is so intense that he is with difficulty kept in bed. Place on 'dangerously-ill' list to-morrow [morphine, grain ½, given].

11 p.m. Patient is worse. He looks exhausted and there is now some spasm of the legs; morphine repeated. 24th August, 1932. After a restless night, patient collapsed suddenly and died at 8-20 a.m.

Copy of a letter dated 24th August, 1932, from Major L. M. N., Staff Surgeon,.....Lines, X, to the Officer Commanding,.....X.

On Sunday, 26th June, 1932 (forenoon), I was sent for by Lieutenant A., who informed me that his dog had gone 'mad' and had bitten about seven other dogs before it could be secured. He had it sent to the Cantonment Veterinary Officer for observation immediately and I was informed that it died later that Sunday. I carefully examined Lieutenant A's arms, forearms, hands and knees and legs and could find no signs of any recent abrasions or cuts and asked him if

at any previous time within the last week or so he had been bitten or had any cuts or scratches that might have been licked, but he could not recollect any. He admitted that he had often been licked whilst playing with the dog and said that the only possible way he might have got any dog's saliva in contact with abrasions of his skin was possibly when he rubbed his cheeks or chin with his hands after shaving. There were no signs of cuts or abrasions on his face when I examined him. I put it to him that he could have a course of anti-rabic treatment if he wished to but that as he had no signs of any cuts or abrasions that I would not order him to have it.

This is a very unfortunate case. From the careful examination carried out by the Staff Surgeon there would appear to have been no urgent indication for anti-rabic treatment when the patient was seen immediately after the dog became rabid.

(Sd.) O. P. Q. R.,

Major, R. A. M. C.,

D. A. D. P. X. District.

3rd September, 1932.

An unfortunate example of the risk taken by patients who decline anti-rabic treatment, even when there appears to be no possibility of infection.

(Sd.)

Lieut.-Col., I. M. S.,

3rd September, 1932.

This is clearly a case of death from a lick with no visible break in the continuity of the skin surface.

The following case was recorded by Malone (1928) in the Annual Report of the Pasteur Institute of India, Kasauli, for 1928 :

'Case 16; table XIII; European; dog proved rabid; saliva came in contact with scratches on both hands; patient was not bitten by the dog.

This is the first death from hydrophobia in a patient "licked" by a rabid animal and treated with carbolized vaccine'.

The table XIII shows that the patient, a female, class I (Hempt), started treatment on 7th May, 1928, and finished on 10th May, 1928. Death occurred 90 days after the lick. The treatment, to say the least, was half-hearted. In this case scratches are admitted. They were not, evidently, regarded as serious.

The Annual Report for 1908 gives another case of infection from a small scratch, recorded by Carter (1908) :

'Two boys aged about 12 years were returning from school when one was unexpectedly attacked and bitten by a rabid dog which escaped into the jungle. The boys state that the dog was furious and frothing from the mouth. The companion of the boy bitten, not observing a small scratch he himself had on his left thumb, touched the wound of his friend. The boy bitten came to Kasauli for treatment, whilst his companion, who received no treatment, developed hydrophobia and died 40 days after the accident'.

Here again a 'small' scratch was disregarded even though the dog was definitely recognized as rabid.

It is admitted that these occurrences are rare. The fact, however, remains that they do exist. Possibly some of the cases of unexpected death from unexplained asphyxia or tetanus are really cases of hydrophobia in which the infection has not been acquired in the usual way by a bite.

In the opinion of the writer, all cases of licks (class I, Hempt) should be given at least the same treatment as cases of superficial bites (class II, Hempt). He has taken three anti-rabic courses of varying strength, during the last 12 years, after accidental contacts with known infectious materials, in the laboratory.

Sequelæ of anti-rabic treatment

A. Paralysis of anti-rabic treatment.

'We have come to the conclusion', says Remlinger (1927), 'that certain institutes conceal their cases'. Or, again, more charitably (Remlinger, 1927a), 'certain mild cases of facial paralysis or retention of urine passed almost unnoticed. Other cases occur after the conclusion of the treatment, when the patient has already returned home. The director of the anti-rabies institute is either not notified at all or is simply informed by letter. Such a communication attracts little attention. Soon the matter is forgotten, and it is with quite good faith that a negative reply is given to a demand for information'. The following cases have been collected at Kasauli or centres supplied from Kasauli, between March and October 1932. The severity of lesions has varied. No death has occurred. Presumably the recovery has been complete:

1. *Incontinence of urine in a European child, aged 2½ years.*

'In May 1931 my daughter then being 2½ years of age had a course of anti-rabic treatment.

I should like to know if as a result of the treatment she could develop bladder trouble, as since that date she has been a hopeless bed-wetter.

The desire to urinate comes on her quicker than we can get her to the commode. The doctor advised us to give her no liquids after 4 p.m. and awaken her frequently during the night. We have tried this but with little success. I would be very grateful for advice in this matter and to know if she will grow out of this rather unpleasant habit'.

P.S.—The trouble has grown on her very gradually.

A 5 per cent brain substance vaccine had been used. Attempts at obtaining more information through medical men did not succeed. But on 15th October, 1932, the father wrote:—

'My little girl is progressing very favourably and is very gradually growing out of the habit of wetting her bed. If I may be allowed to express an opinion, I think it is really bladder weakness and not any after-effects of the anti-rabic treatment she had. Thanking you.....'

If this case is a case of paralysis of anti-rabic treatment, two points are worth recording: (1) age incidence, children having been considered practically immune from the paralysis and (2) incontinence instead of retention.

2. *Pain in hands and difficulty in micturition in an Indian patient.*

'With reference to my case no. 4248, dated 1932, of p. 4, I beg to inform you that from the time I came to Benares I feel very much heat, on account of this reason my mind is roaming always, besides this I have got pain in my both hands and feel some trouble in making water. Nowadays I am in Benares. Please reply me soon as I am in great trouble.

For this act of kindness I shall remain thankful to you'.

A 5 per cent brain substance vaccine had been given. No further information could be obtained through a medical man. Presumably the patient was suffering from a mild neuritis of the arms and a paresis of the bladder. Incidence in an Indian case is noted.

3. *Paralysis of the bladder and the rectum with a paresis of the legs in a European patient.*

'With reference to your letter no. SP/12848, dated 7th August, I would advise that towards the completion of the anti-rabic treatment in L. my stomach became very tender and after the treatment was finished the inflammation appeared to settle in both my groins, showing as a red weal from the fork to the buttocks. I went to D. for four days' rest but I felt decidedly off colour, developing severe headache. I returned to A. and a couple of days later I developed fever and severe pain in my back, making it difficult to find a comfortable spot to sleep. After a couple of days with no relief, my bladder and bowels refused to function entirely, so I went into the M. hospital L., for treatment under Colonel N. and Colonel B. and remained there 5 or 6 days. The urine was taken off by means of a catheter for three days after which I began to pass urine slowly unaided, and thereafter steadily improved. The only medicine I was given in hospital as far as I know was P. C. Before and whilst I was in hospital also for about a month afterwards I had a peculiar feeling in my legs and feet as if they were semi-paralysed. This has now completely worn off.

I would mention that whilst taking the anti-rabic treatment in L. necessitating a motor ride of 70 miles each way, it was exceedingly hot, and probably the long motor drive in the heat had something to do with my subsequent illness.

The above particulars are as correct and complete as I can remember and I trust will be of use to you'.

Yours faithfully,
F. E. B.

This is definitely a case of paralysis of anti-rabic treatment with symptoms typical of the involvement of the cord in the lumbar region. The fact, however, does not appear to have been recognized by anybody at any of the stations mentioned (all big stations). At one of the stations (D.) the likelihood of an accidental puncture of the urinary bladder, during the course of injections, was seriously considered. This consideration and the consequent fear on the part of another patient who had gone to Kasauli from D. for an anti-rabic treatment was responsible for an enquiry into this case which otherwise would not have been recorded at all.

The red weal locally on the point of injections or elsewhere at a distance is known to occur.

A 2 per cent brain substance vaccine had been given for licks (class I, Hempt).

4. *Paralysis of the bulbar type in an Anglo-Indian girl, aged 8 years.*

'..... On the 10th August my youngest daughter was bitten on her feet by my own bull-terrier pup, aged three months. This pup was definitely rabid..... developed paralysis of the legs and died on the 14th night. My child had her bites, amounting to nearly 16 in all, cleaned with ether.....and within half an hour to one hour had her anti-rabic injection, classes III and IV vaccine. Nothing untoward happened till the morning of the 23rd August when all she complained of was that she was very weak and had to be carried to the bungalow, a distance of twenty yards from the B. M. Hospital. That evening we noticed her voice

had sunk to a whisper. She was suffocated and could not drink or eat anything. She was taken into B. M. Families Hospital at M. For four days her condition was critical. Her eyes were blood-shot and at the very attempt at swallowing fluids only came up. Three days later she got a certain amount of paralysis of her left arm. Immediately on completion of treatment she broke out all over with the huge sores and is now recovering slowly.

Remarks on the treatment card by the anti-rabic centre at M.

Child completed treatment on 23rd August, 1932, and admitted into hospital on 25th August, 1932, suffering from laryngitis, acute catarrhal, with some aphonia, no pyrexia and no other unusual symptom. Throat swab negative to K. L. B. Some congestion of throat. No membrane. Treated with inhalation and throat paint. Discharged 30th August, 1932, normal.

The two statements taken together exclude diphtheritic paralysis otherwise there is not much agreement between them. The father of the patient, let it be noted, is also a medical man of some experience. There is no reason why this case should not be diagnosed as one of bulbar lesion. Such cases have been described as representing a culmination of the Landry's ascending type of paralysis of anti-rabic treatment. 'There is difficulty in closing the mouth and the eyes, and in making any sound (the patient speaks only in a whisper and without being able to articulate distinctly). There is difficulty, too, in swallowing, fluids being returned through the nose or causing coughing by entering the larynx, and syncope, tachycardia and dyspnoea supervene. After an extremely anxious time, during which it was doubtful whether or not the bulbar symptoms will cause death at any moment—and this indeed occurs in 30 per cent of the cases—the symptoms begin to improve and then disappear in an inverse order to that in which they developed..... The recovery is complete in a few days or at most in two or three weeks. Weakness, however, may persist for a very considerable time, with a tendency to fatigue, especially in the lower limbs' (Remlinger, 1927b).

Accepting this case as one of paralysis of anti-rabic treatment, then, there are three points to note: (1) age incidence (children not being regarded as liable), (2) race (only Europeans in India are regarded as liable) and (3) primary bulbar involvement (as opposed to a culmination of the Landry's ascending type of paralysis of anti-rabic treatment).

The significance of the 'huge sores' is not understood.

A 5 per cent brain substance vaccine had been given for deep and multiple bites (class IV, Hempt).

B. Epileptiform seizures during anti-rabic treatment.

Only two cases are recorded. One occurred at Kasauli and the other at one of the anti-rabic centres served by Kasauli. Both of them caused quite a commotion at the time but recovered.

Case 1. A military case, European, treated at a military centre.

27th July, 1932. Saw patient at 11-30 p.m. Tonic contraction. Asphyxia. Cyanosis present. Has been having anti-rabic treatment. Some paralysis of epiglottis and great hardness of abdominal muscles. Artificial respiration had to be resorted to on three distinct occasions following contractions. Pulse thready. Sweating profusely. No foaming or frothing from mouth. Unconscious and unable to speak. Did not pass urine or faeces unconsciously during spasm.

Condition improved on applying mouth gag and drawing out tongue with tongue forceps.

The Orderly Medical Officer saw patient and left him in a quietened condition.

28th July, 1932. Quiet and restful. Pulse normal. Respiration normal.

The fits occurred after 10 injections. The treatment was discontinued.

Case 2. A non-military case. European treated at Kasauli.

C. G. R., male, aged 49. Under treatment for a class III bite. History of an operation on the brain and treatment with radium several years ago in London.

On the fifth day of treatment complained of loss of sensation in the legs below the knees. Pressure on Achilles' tendon without response. Knee, ankle and plantar reflexes absent. Loss of sensation to pin-pricks below the knees. Pupil normal. Throat and conjunctiva normal. Superficial abdominal reflexes normal.

The general feeling described as one preceding a 'brain attack' to which the patient apparently had been subject on occasions under mental strain. Treatment suspended.

The patient seen in his hotel next morning in status epilepticus. Several such attacks for two days with intervals of consciousness. Sedatives given.

Recovery complete in a week. Patient left fatigued and tired looking (not altogether due to the fit—domestic worries). In another week the patient left for his station in a normal condition, having taken a modified course of treatment.

No details could be obtained about the previous operation of case 2. The case cannot be definitely regarded as representing a sequel of the anti-rabic treatment. But for case 1 it would not have been described. It shows, however, that even under stormy conditions in the brain a modified course of treatment (1 per cent brain matter) is possible.

Both these cases were being treated with 5 per cent brain substance vaccine when the fits occurred.

C. High temperature resulting from anti-rabic treatment.

A slight rise of temperature during anti-rabic treatment is known to occur. It may even simulate the chill and the sweat of malaria. After excluding malaria by a blood examination no further notice need be taken of it. An interruption of treatment is generally not called for. In 1932 there occurred at Kasauli, however, the following two cases of high temperature necessitating an interruption of treatment:

Case no. 3454 (Kasauli), M. H., European, adult, female. Under treatment for class III bite. History of malaria. Blood repeatedly negative. Admitted 27th May, 1932. Did not complete treatment.

Case no. 3772 (Kasauli), B. T. S., Indian, 28, male. Under treatment for class III bite (Hempt). No history of malaria. Blood repeatedly negative. Admitted 12th June, 1932. Discharged 28th June, 1932.

After the first three or four injections the temperature would shoot up to 103-104°F. a few hours after an injection and would remain stationary until midnight when profuse sweating would occur. Next morning the patients would feel exhausted and refuse treatment. If given a day off they would look and feel quite well, and partake (within prescribed limits) of the social amenities of a pleasant hill station in summer. There was a definite loss of weight. The first case gave up the treatment. The second case was given several days off. Both the cases were being injected with a 5 per cent brain substance vaccine.

D. Troublesome insomnia resulting from anti-rabic treatment.

Two cases occurred that caused considerable anxiety at the time. They recovered, presumably, completely.

Case no. 3454 (first case under C) on her return home developed a very troublesome insomnia. She wrote:—

12th August, 1932.

My husband suggests that I should write and ask you if you could advise me about the after-effects of the dog treatment. Ten days after the last injections I had fever on and off which was proved definitely not to be malaria and then I gradually became unable to sleep at night, until now even sleeping draughts won't help me, and for the last two or three nights I have not been able to sleep until daylight. It's really awful, and we wondered if any other patient had suffered like this, and if you could help me in any way'.

Advice was given. On 24th October, 1932, information was received from her local medical adviser that she had left the station and that the insomnia had improved.

Case no. 5627 (Kasauli), F. L., European, aged 40, female. Treated for class III bite (Hempt). Admitted 15th September, 1932. Discharged 29th September, 1932. Developed insomnia a week after completion of treatment.

Her husband, who had come for anti-rabic treatment later than his wife and had brought her back to Kasauli with him, stated that she had not slept at all the previous night. She looked tired and was inclined to be tearful. Full doses of bromides, an atmosphere of quietness and encouraging remarks on the capacity of the nervous system to stand the strain like that of insomnia restored her to the normal in four days.

A feature common to both the cases was a previous abdominal operation involving probably the pelvic organs. A 5 per cent brain substance vaccine was used.

E. Other complications of a more-or-less local character.

One case of dry and scaly condition of the skin persisting long after the treatment, reported from one of the centres supplied from Kasauli, was the only one that could be included under this heading.

(i) Erythematous patches at the site of inoculation, (ii) scarlatiniform erythema, (iii) urticaria, (iv) acute abscess and septicæmias to which they may give rise, and (v) sub-acute abscess in corpulent subjects, referred to by Remlinger. (1927c), were not seen.

Comments on the sequelæ

Out of the four cases of paralysis three occurred with intensive treatment. The fourth case which, however, was the only typical case of paralysis of anti-rabic treatment occurred with a mild treatment. Opinion generally held is that the incidence of paralysis is independent of the intensity of treatment. It may be so.

Out of the six cases of other complications, fits, high temperature and insomnia, all six occurred with intensive treatment.

The racial influence may be proportional to the facilities for expression.

Carbolization of the vaccine does not ward off the sequelæ. It would not be necessary at all to state this point if the opposite were not so widely believed in India by the general medical profession. In the early history of the Pasteur Institute of India, Kasauli, with introduction of a carbolized vaccine, cases of paralysis of anti-rabic treatment appear to have been absent. Cunningham in 1930 (Cunningham, 1930), however, reported four cases. Later two cases were reported by Shortt (1931) in the Annual Report for 1930. The writer is inclined to believe that the apparent lack of the sequelæ was due to a lack of an efficient system of correspondence. Such a system was evolved and perfected by Cunningham.

In spite of the fact that the morbid anatomy of paralysis of anti-rabic treatment (and presumably of all allied complications explicable on the basis of a dysfunction of the nervous control) has assumed a formidable aspect, in changing from a vascular lesion (Remlinger, 1927d) to a demyelination (Bassac and Grinker, quoted by Hadfield and Garrod, 1932), such as occurs in post-vaccinal encephalitis on the one hand and in disseminated sclerosis on the other, there is some satisfaction in knowing that all the cases reported have completely (with a proviso of probability in two only) recovered.

No attempt has been made to calculate percentages of the various sequelæ as it is felt that all cases of sequelæ have not been collected. The first case of paralysis described occurred amongst cases treated in 1931. All others occurred amongst cases treated in 1932. The total number of cases treated at Kasauli and centres supplied from Kasauli in 1931 was 11,147. Figures for 1932 are not yet available. [The number treated in 1932 was 12,801.—Editor, I. M. G.]

Summary

1. The importance of the infectivity of the rabid dog, as opposed to susceptibility of the victim, in the development of hydrophobia is discussed.

2. Deaths from licks of rabid dogs have been reported from records of the Pasteur Institute of India, Kasauli. Special attention has been

(Continued at foot of next page)

EPITHELIOMA ADENOIDES CYSTICUM

REPORTS OF THREE CASES

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UNTIL recently, tumours arising from the epithelium of the skin and its appendages were generally known as carcinoma of skin and no attempt was made to classify them into various types according to the predominant type of cell of the new growth. To Krompecher (Kaufmann, 1929) belongs the credit of separating the various forms of skin carcinoma into :—

1. A basal-celled type called 'basal-cell epithelioma'.

2. A squamous-celled type.

Some authors call them non-cornifying, and cornifying carcinoma or acanthoma. These two types differ not only in their histological characters but also in their clinical course, response to treatment and progress. Hanse-mann (Ewing, 1928) contends that since all

(Continued from previous page)

drawn to a recent death from licks with 'no visible break in the continuity of the skin surface'.

3. Sequelæ of anti-rabic treatment have been recorded. Deviation from the type has been noted in cases of paralysis. Cases of high temperature, insomnia and fits have been included.

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epithelial tumours arise from the basal cells the term basal-cell carcinoma was not quite suitable. But Krompecher's choice of term may be justified on the ground that basal-cell epithelioma is composed of basal cells which retain their morphological characters throughout their existence, in contrast to the squamous-cell carcinoma in which the basal cells are further differentiated and lose their original characters. Epithelial tumours of the skin showing a tendency to reproduce the structure of dermal glands are designated as adenoid epithelioma. These tumours may show cystic spaces and are then known as epithelioma adenoides cysticum. We have come across three cases of this type which are reported here.

REPORTS OF CASES

CASE I. Clinical history.—Female, aged 30 years. The trouble began one year ago with headache and pain in the left eye. The latter gradually protruded and vision began to fail. The conjunctiva, congested and œdematous, bulged in front of the socket and the lids could not be closed over the eyeball. Gradually headache which was originally severe changed into pain of a dull character and vision became completely lost.

On admission, she showed marked exophthalmos, the eye projecting about one inch in front of the socket. The eyeball, which was collapsed and tensionless, was situated at the summit of the swelling. On palpation through the conjunctiva, a firm lump appeared to fill the socket entirely.

The conjunctiva was incised round the eyeball which was excised. There was no sign of infection within the eyeball. The growth felt hard and appeared to fit tightly in the socket. On passing the handle of the scalpel round the growth, it was possible to separate it from the surrounding bony walls without force, it was not attached to the periosteum except at one spot, even here not firmly. There was very little hæmorrhage. At the operation, the lachrymal gland was not identified, as such, and the surgeon thought that it had either entirely atrophied as a result of pressure of the tumour, or that the growth arose from the gland and had replaced it. There were no metastases. The patient left the hospital two weeks later in good condition and well satisfied except for the loss of the eye.

Naked-eye appearance of the growth.—The growth, $1\frac{1}{2}'' \times 1''$ in size, was conical in shape, and felt firm like a hard fibroma without any glandular lobulation. In section, it presented a uniform greyish-pink appearance without oozing of any fluid.

Microscopic examination.—Section of the orbital growth under low power shows numerous cell collections of varying sizes which are separated from one another by bands of dense fibrous tissue. These cell masses contain a number of spaces of different sizes which are either empty, or containing either an acidophilic or a basophilic substance (plate I, figure 1). There is no stratified epithelium on the surface. Under high power, the periphery of a cellular mass is seen to consist of elongated cells bearing a close morphological resemblance to the basal cells of the epidermis which are arranged in a palisade manner (plate I, figure 2). The central zone of some of the cell groups consists of cells in various stages of disintegration, for example, those in the centre are devoid of nuclei and the remnants are acidophilic in reaction. As we proceed towards the periphery, the degeneration becomes less marked so that the cells at the extreme periphery are normal in their staining properties. Some of the cystic spaces are filled with a colloid-like substance. In others, a brownish amorphous substance is present. The contents are homogeneous, granular, or laminated. The cells internal



Fig. 1.—Note the cystic spaces of varying size filled with granular or amorphous material.



Fig. 2.—Showing wall of one of the cystic spaces under high power. The cells at the extreme periphery are elongated and are arranged in a palisade manner. The cells internal to this layer are in various stages of disintegration.

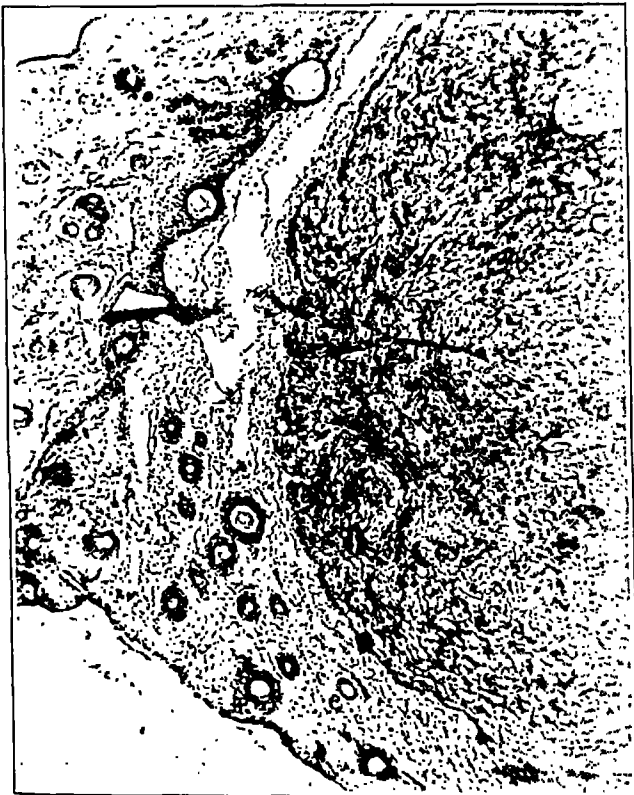


Fig. 3.—There is a large mass of cells in which are seen small cystic spaces. At one side are the hair follicles.

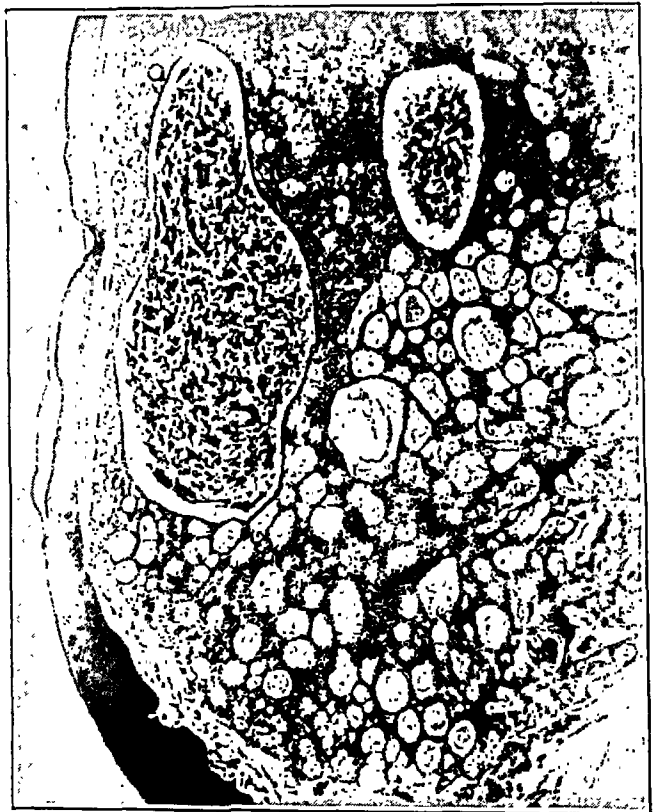


Fig. 4.—Note the atrophy of the surface epithelium and the subjacent cystic spaces. One of these, at the upper part is very large and contains granular material.

to the peripheral basal-cell layer are more or less round or oval shaped. The cytoplasm is small in amount and the nuclei which are round or oval are deeply stained. Mitotic figures are not noticed. There is no transformation of these proliferating cells into the squamous cells. The connective tissue stroma is infiltrated with plasma cells and lymphocytes and in some places shows a marked degree of hyaline degeneration.

CASE II. Clinical history.—None available. The patient, a female, had a small nodular growth on the eyelid.

Microscopic examination.—A section of the growth under low power shows skin epithelium which appears atrophic and lacking in the normal papillae, but the basal-cell layer is intact. Beneath the epithelium are seen cell masses containing clear spaces. Beyond the cell masses, at one side, there are smaller collections of cells with a central lumen. These are hair follicles and are embedded in a delicate connective tissue stroma (plate I, figure 3). A striking feature of the section is the close proximity of the cell groups to the surface epithelium without its actual invasion. Under the high power, most of the cystic spaces appear empty, but in a few of these commencing myxomatous degeneration may be seen with typical stellate cells. The impression gained is that the connective tissue stroma has been enclosed by the growing masses of cells with its subsequent degeneration from lack of nourishment. At the periphery, the cells appear more elongated than those at the centre. The cells are mostly long, spindle-shaped with fibrils. There is a marked degree of infiltration of the stroma with lymphocytes.

CASE III. Clinical history.—A female, aged 50 years, was admitted to the Government Hospital, Royapettah, Madras, for the treatment of a hard nodular swelling, the size of a hazel-nut, situated on the upper lip. The growth was painful, showed lobulation, and was fixed to the upper lip on the left side. None of the lymph nodes showed enlargement; duration two years.

Microscopic examination.—The section taken from the growth shows the epidermis to be thinned out; the papillae are atrophied over the tumour (plate I, figure 4). The cell groups are very close to the surface epithelium and are almost in contact with the latter. The cystic spaces are occupied by a basophilic substance probably mucoid in character. The spaces present a reticulated appearance which probably depends upon the degeneration of the cytoplasm and nuclei so that only the faint outlines of the cells remain. A few of the spaces show brownish granular material. The cells lining the cystic spaces are flattened and elongated. Hyaline degeneration of the stroma is seen in a few places. No lymphocytes, or plasma cells are seen in the connective tissue stroma.

DISCUSSION

Histogenesis.—Naturally, the most interesting question concerns the origin of these tumours. Krompecher derives them from the basal cells of the skin, hair follicles, sweat and sebaceous glands. This view has been accepted by the majority of workers but a few oppose it. Borrmann (Ewing, 1928) traces their origin to the basal epithelium; but, according to this worker, it is not the surface epithelium which gives rise to these tumours, but the embryonal cell groups which are derived from the skin and its appendages, and are situated in the corium; hence the name 'corium carcinoma'. It may be mentioned in support of this view that in the case of many early tumours the cell groups are isolated showing no connection with the epidermis and that they occur chiefly along embryonal fissures, chiefly of the face and in the salivary glands. Moreover, the partly

embryonal characters of the cells composing the tumours also favour this view. In some instances however one can see the stalk-like band of cells connecting the basal layer of the surface epithelium with the tumour cells underneath. But as the tumours grow, the connecting band for some reason is lost. This explains the apparently complete isolation of the tumour cell collections from the epidermis. It has already been stated that basal-cell tumours may arise from the hair follicles. They may show adenoid cystic characters, but differ from the others in producing long, fine and coarse fibrils. Mallory (1914) lays special stress on its origin from the cells of the hair matrix which form the hair and its sheath and whose capacity for differentiation is extremely limited compared to those of the epidermis. The cells develop large numbers of delicate fibrils and the tumours springing from these cells are composed of spindle-shaped cells with long, fine and coarse fibrils running in the direction of their long axes. This feature was very pronounced in sections of our case II and we are inclined to trace its origin to the cells of the hair shaft. It will be seen that basal-cell tumours may arise from the basal cells of the epidermis, hair follicles, sebaceous glands, and sweat glands or from misplaced embryonal basal cells in the corium.

The question of the exact source of the growth in case I is somewhat difficult. It was noticed at the operation that the lacrimal gland could not be identified by the surgeon and he concluded that it had either undergone atrophy from pressure of the growth or that the growth had originated from the gland itself. Assuming its derivation from the lacrimal gland, the possibility of its being of the nature of a mixed tumour has to be considered. Before proceeding further, it is necessary to discuss the nature of the mixed tumours. These tumours are composed of epithelial elements which may occur as alveoli, diffuse masses, or cell strands and mesoblastic tissue chiefly cartilage, mucous tissue and cellular connective tissue. The origin of these tumours has long been a subject for discussion and the present position may be summarized in the following statements:—

1. The theory of endothelial origin of the so-called mixed tumours has been abandoned since it was first shown by Hinsberg and later by others that the parenchyma in some specimens consisted of unmistakable glandular or squamous epithelium. The histological characters of the cells of these tumours are different from those of the endothelial cells of blood vessels. This tumour (case I) was originally reported as endothelioma from this laboratory, but on studying the section after many years, we, who had not seen it before, came to a different conclusion. It struck us that the contents of the cystic spaces were of unusual nature for an endothelioma. In a capillary endothelioma, the lumen of the vessels is either

empty or only shows a slightly acidophilic homogeneous material. In the case of hæm-endothelioma, of course, one finds blood corpuscles. The contents of the cavities in the case under discussion were of a varied character. Some were strongly acidophilic, others of different shades of blue. In either case the material was either homogeneous or granular. We were convinced from a study of the section that the material contained in the cystic spaces really represented degenerated cells, but it is possible that in some cases it was of the nature of a secretion from the glandular cells.

2. The epithelial origin of these tumours is now generally accepted, but the presence of cartilage in these tumours has been interpreted in various ways :—

(a) That the cartilage is derived from an embryonal cartilage in the neighbourhood of the gland or that both the cartilaginous and the epithelial elements spring from the multipotential cells.

(b) That the cartilage may be derived from the epithelium by a process of metaplasia (Krompecher). The transition of the glandular epithelium to the cartilage has been noticed by some observers and Ewing is convinced of the derivation of mucous tissue and cartilage from gland epithelium. Transformation of one type of tissue into another of the same class is well known, but such transformation does not take place between tissues of totally different types, for example, an epithelial tissue does not become changed into connective tissue, or *vice versa*.

(c) That the cartilage may be derived from the mucoid connective tissue by a process of metaplasia.

(d) That the so-called islands of cartilage consist merely of connective tissue stroma undergoing mucoid change in which the epithelial cells lie free in small spaces around which there may be a fibrillar condensation with a resulting pseudo-capsular arrangement around the cells (Fry, 1927). It may also be noted that the boundaries between the mucoid tissue and cartilage are not well defined, so that one merges imperceptibly into the other, giving the impression that the mucoid tissues are becoming changed into cartilage. In view of this interpretation of the mesoblastic elements, the so-called mixed tumours are to be regarded as benign epithelial growths with mucoid degeneration which results in the formation of some material which looks like cartilage.

From a study of the literature and of the material in our collection, it appears there are two sources of the mixed tumours :—

(i) Some of these originate from the ducts and acini of the glands and present an adenomatous structure. As these spring from differentiated cells the tendency to form alveoli and glandular structures is distinctly noticeable and well marked. They form part of the gland and many of them are not encapsulated.

(ii) Others arise from embryonal cells, misplaced or located in the gland itself. Branchial remnants may also serve as the origin of such tumours. Originating as they do from comparatively primitive cells, the tumour cells do not form definite glandular structures but only show a superficial resemblance to these. They show the structure of the basal-cell or adenoid cystic epithelioma, and are usually encapsulated and are extra-glandular. Our case I belongs to this category.

Structure.—While the initial response in this group of tumours is a proliferation of the basal cells, the ultimate results vary greatly and thus they come to present different clinical and histological characters. For example, cystic spaces may be found in the cell masses, which may be formed in various ways :—Firstly, the tumour cells during the process of their growth may enclose an island of connective tissue which is thus cut off from its blood supply and undergoes degeneration. This is clearly seen in sections from our case II. Secondly, the wall of the blood vessel which is surrounded by tumour cells may degenerate giving rise to a cystic space, limited by tumour cells. Thirdly, which is probably the commonest, the cells situated in the centre of the solid cell groups themselves may degenerate from lack of nourishment. We have noticed in one and the same slide all stages of development from a commencing degeneration of the central zone of the cell masses to fully formed cystic spaces containing cellular debris, mucoid or colloid material. Sometimes the walls of the cysts have been known to disappear and the colloid undergoes calcification. But this has not been noticed in the present section. Some authors have reported the transformation of the proliferating basal cells into squamous cells. We have not noticed this change in any of our sections, but considering the capacity of the basal cells for differentiation into squamous cells, such an occurrence is not at all unlikely.

Classification.—Krompecher divides the basal-celled tumours into six types according to certain forms of growth and of degeneration. This classification appears to be somewhat complicated. Frieboes (McCarthy, 1931) proposes a simple one, which considered from the clinical standpoint and histological changes is convenient and useful. This may be slightly modified for purposes of description as follows :—

Type I. *Carcinoma basocellulare solidum* of Krompecher, which is composed of solid masses of cells. This embraces all the tumours commonly known as the basal-celled tumours proper and is called reticulated epithelioma by Ewing.

Type II. *Adenoid epithelioma*.

(a) Without cystic spaces. Simple adenoid epithelioma is composed of cells arranged in the form of alveoli lined or filled with cylindrical or cuboidal epithelial cells. There are no cysts.

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PETIT MAL OR PYKNOLEPSY

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EPILEPSY is an age-old yet ever new and common morbid clinical state, and is one of the great problems that still baffles medical science.

(Continued from previous page)

These tumours originate either from the dermal glands or hair follicles or from the embryonal basal cells which differentiate into glandular structures.

(b) With cystic spaces—cystic adenoid epithelioma, Brooke, 1892. It appears to us that some closely related conditions have been described under different names such as trichoepithelioma, adenoma sebaceum and syringoma on insufficient grounds. The first two are so closely related to epithelioma adenoides cysticum as to be indistinguishable clinically and pathologically. Syringoma is said to differ from epithelioma adenoides cysticum in that it is not hereditary. Considerable confusion has been caused by the introduction of these terms and we are of opinion that they should be avoided as far as possible.

Type III. *Cylindroma*, or *nævus epithelioma cylindromatosis*, is histologically characterized by hyaline change in the connective tissue surrounding masses of tumour cells. Clinically it can be distinguished from other types of basal-cell tumours by a large and more variable size of the lesion which is not pedunculated and occurs usually in the scalp.

A type intermediate between I and II has been described, but the clinical and morphological characters do not appear to be so well defined as to describe it as a separate clinical or pathological entity.

Summary

Three cases of epithelioma adenoides cysticum are described with special reference to their histopathology. In the first case, the tumour has originated either from the lacrymal gland or from its neighbourhood and the grounds on which this has been regarded as a cystic adenoid type of the so-called mixed tumour have been stated. The derivation of case II has been traced to the basal cells of the hair matrix. The histogenesis, structure and classification of these tumours are considered in some detail.

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Though Hughlings Jackson described it as a 'disease characterized by occasional sudden, excessive, rapid, local discharges of cortical grey matter', the more modern view is that epilepsy is not a disease but a symptom, a phenomenon of a state, the causes of which are many.

The approach to this complex problem is by no means lightened when one reads the terse summing up of the modern views on this subject by an eminent neurologist, Kinnier Wilson, who says, 'The truth is, the condition defeats us on many grounds; its ætiology is heterogeneous, its semeiology indeterminate, its pathology dubious, its pathogenesis conjectural, and its therapeutics empirical'. To diagnose a case as major epilepsy may be as easy as recognizing the signs of a fully-developed psychosis, but to trace it down to its ætiological basis is a different matter. The various conflicting ætiological theories—vascular, humoral, autotoxic, reflex, etc.—offer no pragmatic clue as to what part of the vast cortical field is stimulated, and how. Does the epileptic 'discharge' begin in one particular area and then spread to others, or is the whole cortex stimulated at once? The psychogenesis of epilepsy finds little support in modern textbooks. Epilepsy is essentially a neurological condition of neuronie derivation. Psychisms may be present however and influence the production of motor fits in any particular case, but they cannot be said to be *per se* the cause of them. A peculiar syndrome that has been for want of a better term misnamed hystero-epilepsy presupposes a combination of the factors of both epilepsy and hysteria. Another peculiar condition that is often described in conjunction with epilepsy is narcolepsy, because of the close similarity to *petit mal* for which it may be mistaken. The late Dr. Adie, however, clearly showed that narcolepsy is a disease *sui generis*.

Another peculiarity sometimes noticeable in epilepsy is that it may appear suddenly, generally at puberty, in an individual whose family history is free from any neuropathic diathesis. Again, although the usual march of epilepsy is progressive there are rare cases where the condition suddenly stops for some unaccountable reason, sometimes after an acute illness.

Another disorder which closely resembles *petit mal* is pyknolepsy. Under the title of paraepilepsy, Vergara has included this disorder with other paroxysmal affections such as migraine, vaso-vagal attacks, and periodical crepuscular states.

The difference between pyknolepsy and *petit mal*, however, is that in the former we have a larger number of attacks, the absence of occasional major seizures, the lack of intellectual deterioration and a tendency to spontaneous cure, especially at puberty. Is it possible that the symptoms of *petit mal* and pyknolepsy may coexist, or that the border-line between these

states overlaps so that one state passes imperceptibly into the other?

The symptoms of the following case which closely resemble that of larval epilepsy are described to show their peculiar and indeterminate nature, and the doubt and indecision they may cause in diagnosis.

K. C., a Muslim boy of 13, was admitted on the 11th October, 1934, from jail, to which he was sent for hitting a woman on the head with an axe without provocation while she was asleep. While in prison he was certified as insane, as he was violent and aggressive, talked incoherently, was dirty and destructive, and used to knock his head against the wall and floor.



A year previous to this, he had struck a little child who died from the effects of the injury a month later.

The previous history is that at the age of 3 months he used to cry incessantly and suffered from 'fits'. At the age of 4 years he injured his head by a fall, after which he used to get fits twice daily. There is no history of epilepsy or psychoses in the family.

On admission, he was 4 feet in height and fairly well built but the genitalia were infantile. He has several scars on the occipital region of his skull, the result of frequent falls.

This region is abnormally shaped. On the right side, there is a slight depression and then

the occiput protrudes in a conical shape to the right. The scalp over this area is freely movable, and it feels boggy and oedematous as if there was fluid underneath. X-ray examination revealed no abnormality in the skull, except thickening of the lower part of the occipital bone. When pressure is applied to this part he feels pain, headache, and faints. These symptoms have now subsided and firm pressure on the skull causes no discomfort.

His intellect shows no deterioration, which one would expect in a boy with epilepsy from the age of 4. In fact he is very intelligent, and precocious. He talks quite sensibly, memory, orientation, perception and ideation are well preserved. Emotionally he is unstable. He is usually very affectionate and playful, but in the midst of this he will suddenly strike anyone nearby. He is extremely grateful for any gifts and soon after receiving them he may suddenly throw them away or strike the giver and then immediately prostrate himself and contritely crave forgiveness, knowing he has misbehaved. When asked to explain his conduct he states that he is more-or-less constantly worried by visual hallucinations of two black men whom he sees making grimaces at him and annoying him. Hence he tries to strike them and as he gets annoyed strikes anyone nearby. Another peculiarity is that the sight of a mirror, a pair of spectacles or any polished surface he sees induces a feeling of fear. This produces tachycardia and he says that glasses or a mirror accentuates the hallucination.

He assaults any one wearing glasses, but the impulse to strike is uncontrollable and is not vicious. His vision is normal and the optic discs reveal no abnormality. There are no physical signs of a cerebral neoplasm. Since admission he has had no major fits, but when told to walk slowly he gets sudden mild transient attacks of giddiness and falls backwards, striking his head on the ground, but never losing consciousness. When walking slowly, his head is bent forwards and his eyes are fixed on the ground, and then he suddenly stops and sways backwards, but immediately pulls himself together and walks on. These attacks of swaying can be checked by a sharp command from any one nearby and thus they resemble closely the cataplectic attacks seen in narcolepsy. On the other hand, the boy never falls when he runs fast and he enjoys sprinting along the verandahs or grounds at a rapid rate. He never falls while playing about with a football. He falls only when he walks slowly alone, and yet he has no Rhombergism, ataxia, or inco-ordination of his limbs. He is therefore afraid to walk alone and wants to be led by a servant lest he should fall. The impulse to strike others is lessened if any one holds his hand, but if the hallucinations are strong enough he will still make the attempt

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A PRACTICAL WAY OF DEALING WITH ÆDES ÆGYPTI (STEGOMYIA FAS- CIATA) MOSQUITO BREEDING IN COUNTRY CRAFT

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Ædes ægypti, the potential carrier of yellow fever virus, is widely spread throughout Bombay as was pointed out by Colonel Covell, I.M.S., and reiterated in a recent report on the subject by Dr Mahtre, Malaria Officer of the Bombay Municipality. In the city itself its breeding places extend as far north as Mahim, to the south to Colaba, and to the west to Malabar Hill; it breeds in garden-water tubs, fountains, antiformicas, vases, and utensils for storing water, wherever the water is not emptied out at regular intervals, and it is specially prevalent in thickly-populated parts of the city such as Khetwadi, Girgaum and Chowpaty.

Attention was drawn as far back as 1910 to the danger of this common species of Bombay mosquito as a potential carrier of yellow fever, by Colonel Gordon Tucker, I.M.S. Once the virus can travel from the West Coast and hinterland of Africa to the East Coast and thence by speedier air transport to India, the ports of India likely to be infected will be the major ports of Karachi and Bombay and some of the recently-sprung-up Kathiawar ports and, to a lesser extent, Marmagoa and the ports lying along the south-western coast line of India.

This important matter must needs therefore receive the serious attention of the local authorities, the local and central governments and full power and authority must be granted to the first of these to enable them to deal effectively with all vessels, including steam and sailing ships, and aircraft coming from endemic centres of yellow fever.

About half the sailing vessels, lighters, *dhow*s, and other country craft that enter Bombay

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which is a gesture at striking the terrifying figures he sees. When he is placid and playful, the presence of the hallucinations can be detected by the sudden rapidity of the heart and a change in his expression and temper. Cerebellar disorder may be ruled out by the absence of constant giddiness, reeling, inco-ordination, or *adiadokokinesis*.

The peculiar configuration of the skull at the occipital region may be responsible for some form of pressure there, resulting in the visual hallucinations and the falling backwards. Beyond that it is difficult to classify the case as either *petit mal* or *pyknolepsy*, and yet the symptoms are so closely related. Treatment which is purely empirical is of no avail.

harbour for local trade breed the *Ædes ægypti* in their drinking-water barrels or boxes. A survey of these made by me from 26th February to 13th April, 1935, shows that out of 898 country craft examined 458 were harbouring the larvæ of this mosquito. Apart from its potential danger, the bite of this mosquito is most annoying as testified by complaints from shipping personnel in the docks.

Prior to my taking over charge of the anti-malaria and anti-mosquito work in the docks and bunders of Bombay, nothing had been done to mitigate this nuisance from country craft owing to the lack of statutory power. I instituted a regular campaign to deal with the trouble and, in spite of the lack of statutory authority, I have by means of education and persuasion been successful in tackling the problem, as may be seen from the following figures:—

Country craft examined at Alexandra Dock,
Princess Dock, Victoria Dock and Sassoon,
Malet and Carnac bunders

	Number	Percentage
Examined	898	..
Found breeding <i>Ædes ægypti</i>	458	51
Emptied out	385	43
Refused examination ..	31	4.3
Refused emptying ..	69	7.6

It will be seen that rather more than half of these brought into the docks harbour larvæ of *Ædes ægypti* in their drinking-water receptacles which are often found teeming with them.

The procedure adopted to clear them has been as follows:—An overseer with a gang of coolies inspects a collection of country craft in a dock or bund; if the drinking water contains larvæ the number of the craft and the place where it came from is noted. The master or *tindal* of the vessel is given a notice to the effect that it is in his own interest as well as of the shipping and the docks that he should help in destroying the larvæ breeding in his drinking-water barrels or boxes. It may be mentioned that these receptacles are invariably of wood, have no draw-off tap, and no properly fitting lid. A native craft sometimes carries more than one of these barrels or boxes, while those coming from distant ports like Bhavnagar, Kutch, Mandvi and Marmagoa have square ones often of a capacity of 400 or more gallons. There is a small opening at the top whence water is taken in and drawn off for drinking purposes, at most covered up with a bit of rough plank, so that it is accessible to dirt of all sorts and is a suitable place for the mosquito to lay its eggs.

Water has been usually procured in their native places or ports from wells or rivers near the bunders along which the country craft call for cargo. They are never emptied out thoroughly but water is added as required at every bunder or port of call. The larvæ of *stegomyia* are often found on the surface, if breeding is excessive, and from the bottom invariably, on scouring it. The overseer then explains to the master or *tindal* that it is necessary for the drinking water to be emptied out, the barrel or box thoroughly scoured, dried, and then refilled with fresh water. If he voluntarily complies with this, he is given a pass or certificate for free supply of water from the docks or the bunders.

So far this procedure has worked well as can be seen from the above figures, as many as 86 per cent of those showing breeding adopt this procedure and empty out the infested barrels. About 4 per cent refuse inspection, which is not compulsory, and about 7 per cent refuse to empty out usually because they have their tanks full and are in a hurry to sail, having taken fresh water recently without thoroughly emptying out the bottom of the tanks.

The following powers will have to be obtained in dealing with this problem when a proper local sanitary authority is created.

1. Right of inspection.

2. Right to insist on the provision of regulation mosquito-proof tank with proper fitting lid and a draw-off tap at the bottom. The tank to be certified by the registering authority at their respective bunders and ports and subject to periodical inspection and emptying out and cement washing.

3. Right to prosecute for non-compliance after preliminary notice or warning.

The various country craft or sailing vessels that call at Bombay hail from a long littoral, the Western coastboard of India; from Kutch, Mandvi, Bhavnagar, Okha, Broach, Surat, Bulsar, Billimora, Palghar, Bassin and Thana to the north and from Karanja, Ratnagiri, Goa, etc., to the south. The whole of the Western coast of India is more or less infested with this mosquito, and Bombay is far from being the only offender in this respect.

At present, the only solution lies in tackling its breeding grounds, and a preliminary effort has been made, as described above, to lessen the nuisance as far as possible, in the absence of statutory powers. The result has been that there are now less complaints from the areas treated than there were before.

My thanks are due to Mr. W. R. S. Sharpe, ex-chairman, Bombay Port Trust, and also to the Docks Manager and Deputy Conservator of the Port, for rendering all help in carrying out the above measures.

A NOTE ON AN UNUSUAL SOURCE OF CONTAMINATION OF WELL WATER

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A DEEP well, intended to serve as a source of water supply for drinking and locomotive purposes, was constructed in 1931 at one of the west coast stations in South Kanara district. The water from this well was found to be of very fair quality for either purpose at the time of its construction and for some time thereafter. During the last twelve months, however, there has been a progressive deterioration in the æsthetic qualities of the water, although the chemical features had not appreciably changed since 1931. The water assumed a dirty brown colour and the sides of the brick wall of the steining in contact with water grew a dirty-green type of alga. In certain places the brick-work developed also a definite oily coating. The authorities concerned sent samples of the water and of the growths to the King Institute for examination and report. The results of the examination revealed nothing special that would account for the troubles complained of, and a questionnaire asking for detailed information on various points relating to the source and its location did not succeed in eliciting information of value.

At the request of the authorities concerned a local inspection and survey, accompanied by field tests, was recently carried out by the author. The well is a *pucca* built well with a perfect steining and with no evidence of any surface pollution entering through defective spots therein. The pump-house is located outside the well and the suction pipe entering the well was absolutely free from any trace of oil on it. No oil could enter the well from the pumps. There was a vague smell of petrol or kerosene in the atmosphere near the well. A sample of water drawn by means of a bucket smelt very definitely of petrol. Individual opinion of six different intelligent and unbiased observers confirmed the presence of the smell of petrol or kerosene.

A careful survey of the locality and surroundings of the well was next made. About 100 yards away from the site of the well the storage depot of a petroleum company has been built on a little mound about 15 feet high and has been in existence for a number of years. From careful enquiries made of the local agent of this depot, it was elicited that there was a considerable leakage of petrol from the underground tanks in this depot about 4 years ago. The agent also stated that when petrol leaks into the ground, it can remain there for a long time impregnating the soil, and find its way slowly into water sources laid in the area. The following note from a recent editorial in *Water and Water Engineering*, London, would appear to

lend weight to the theory that the well was probably being contaminated by the old leakage from the petrol tank.

'The water supply of Beverley has recently been unpleasantly but not injuriously affected by kerosene contamination from the gas works. Due to a leaking underground pipe-line carrying the kerosene oil from the main tank, the oil had percolated through the ground, impregnating the well area.

The trouble has now been righted by the Council's action in having the pipe, which was not a lead one, put overground. The contamination extended downwards a good many feet and may take some time to be eliminated from the soil'.

Dye tests were carried out, by introducing first uranin and then fluorescein, into a *nullah*

flowing within ten feet of the well. A dam was put up across this *nullah* and the dyes were added to the reservoir so formed. The well was subjected to vigorous pumping for the next 12 hours. The dye could not be detected in the well water. This negative finding could not, however, be accepted as significant, as the *nullah* was a shallow channel and as the feeder springs to the well might be from a different direction and at much lower depths.

Tests were then carried out to eliminate the colour, taste and odour in the water of this well. The addition of a grain each of alum and lime per gallon (the pH of the untreated water being 6.4) followed by the addition of 1 grain (per gallon) of powdered activated carbon and subsequent settlement for 3 hours resulted in the production of a perfectly æsthetic water suitable for drinking purposes.

A Mirror of Hospital Practice

INFECTION WITH *BERTIELLA STUDERI*

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and

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THE patient, a European boy, aged five years, had two or three attacks of vomiting without apparent cause on the 29th October. He was given a dose of castor oil on the morning of the 30th and according to his mother passed a stool normal in appearance. About 2 a.m. on the 31st October the boy was seized with an acute attack of pain of a colicky nature, and although considerably relieved by a small dose of brandy he was brought to the British Military Hospital, Fyzabad, the same morning.

He was found to have slight abdominal pain but there was no tenderness. He was given a dose of magnesium sulphate mixture and shortly afterwards passed a stool containing a chain of tapeworm segments. That evening the temperature was 102.2°F. and there was slight abdominal pain and headache.

On the 1st November the temperature was normal and the patient passed several liquid stools after a further dose of magnesium sulphate, but no more worm segments were found.

On 2nd November the patient was given three doses of extract of male fern each of ten minims at seven, eight and nine a.m. respectively and the last dose was followed by a dose of magnesium sulphate mixture. No more tapeworm segments were passed and the boy was discharged from hospital the same day apparently quite well and he has remained well for over a month.

The abdominal symptoms were in all probability not referable to the tapeworm infection but were most likely caused by a moderately acute attack of gastro-enteritis of short duration such as children are commonly liable to, and the passage of part of a tapeworm was only a sequel to the brisk purgation to which the patient had been subjected.

The segments of the worm though somewhat decomposed stained well enough to enable their definite identification as those of a *Bertiella* sp. which according to the work of Adams and Webb (1933) is almost certainly *Bertiella studeri*.

Two cases of human infection with this parasite have previously been recorded in India, one by Chandler (1925) and the other by Maplestone (1930). Both these infected persons had lived in Eastern Bengal all their lives and were both Hindus. The present case is in a European child who during his residence in India has lived in Cawnpore for five months, Lucknow for two years and Fyzabad for one year, in that order. Other records of this parasite in human beings are from Mauritius four times, the West Indies twice and Sumatra once. It should be noted that Adams and Webb (1933) include a case reported by Mukerji (1927) but this is only a reference to the one recorded by Chandler, therefore the case of Adams (1935) is the ninth and the present one the tenth. In addition to the above ten cases in which either the whole or part of the worm was recovered Sharma (1930) claimed to have found the eggs of this worm in three stools out of 503 examined at Shillong.

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After the subsidence of the inflammation an incision was made through the septal opening and the vagina was thus made quite patent. The cervix had the usual signs of pregnancy and the uterus seemed to correspond to the size of a three months' pregnancy. It is interesting to note that pregnancy could occur in this case and that spermatozoa could pass through the small opening and subsequently through the external os. The septum was not tense and could, on vaginal examination before operation, be pushed up to the cervix by the finger. After the division of the septum, the vaginal passage seemed quite normal.

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Primary tuberculosis of the intestine

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The site of lesion is the ileocæcal region, the most frequent site being the cæcum, but the terminal ileum and the ascending colon may also be involved. Occasionally the appendix is also affected.

The important factors probably concerned in the explanation of this peculiar lesion are (a) a

fairly high grade immunity to tuberculous infection, (b) infection by a small number of bacilli and (c) infection by bacilli of low virulence, in many cases bovine in origin.

Two important phenomena are associated with the condition, namely (a) a large tumour is palpable in the cæcal region and (b) signs of chronic intestinal obstruction manifest themselves. The treatment consists in resection, or a short-circuiting operation.

The disease is said to be fairly prevalent in Europe and less so in America. It is rare in India probably because bovine tuberculosis, as has been pointed out by Lankester (1920), is not common in this country and milk which is the main source of the bovine bacillus is not taken raw. Further, judging from the universal and abominable habit of spitting anywhere and everywhere which is so prevalent in this country, the human bacillus would appear to be the commonest source of infection and intestinal tuberculosis is therefore found to occur as a common complication of and secondary to the disease in the lungs.

Secondary intestinal tuberculosis

This is a very common complication of pulmonary tuberculosis and is the result of swallowing sputum consciously or unconsciously. Calmette (1923), however, believes that the constant elimination of the bacilli in the bile may also furnish the source of infection to the intestinal tract.

Secondary tuberculosis of the intestine is a manifestation of Koch's phenomenon and is, therefore, frankly ulcerative. Owing to the sensitization of the body that has already taken place by the presence of the disease in the lungs, the chief struggle for mastery has now been transferred from the regional lymph nodes with which the body is naturally endowed, to the cells of the mucous membrane of the intestinal tract on which has been conferred the specific defensive rôle as a result of the primary infection in the lungs. There is not much reactive fibrosis and the muscular coat is rarely penetrated completely in this type. Intraperitoneal perforation is uncommon owing to the formation of adhesions between the coils of the intestine. In contradistinction to the hyperplastic type, this variety rarely gives rise to any serious obstruction partly due to the destructive character of the lesion and partly because the patient usually dies before cicatrization can take place to any appreciable extent.

Site of lesion

The most frequent site of affection is the ileo-cæcal region—the terminal part of the ileum, the cæcum and the first part of the ascending colon. The probable reasons for this are:—

(a) Tuberculous disease first attacks the lymphoid tissue and this in the form of solitary

follicles and Peyer's patches is abundant in the terminal part of the ileum.

(b) Absorption of the last products of digestion takes place in the terminal ileum and the infected material comes in direct contact with the mucous membrane.

(c) The bowel contents remain for quite a long time in the ileo-cæcal region thus giving opportunity to the bacilli to cause infection in this region.

It is well to bear in mind that the lower portion of the ileum, the cæcum and the ascending colon have two points in common. Each represents the part of their portions of the digestive tract where slowness of the passage of contents and absorptive activity are most pronounced.

Pottenger (1922) has suggested the possibility of trophic disturbances in the cells of the intestinal wall brought about by prolonged stimulation of the sympathetic and vagus nervous system which lower their resistance to infection.

It is interesting to mention here that tuberculous ulceration of the intestine spreads at right angles to the long axis of the bowel in contrast to the ulceration of typhoid fever. The reason is that tuberculous infection spreads along the course of the lymphatics which run around instead of lengthwise of the intestine.

The problem of secondary intestinal tuberculosis is exactly what the problem of pulmonary tuberculosis was some fifty years ago; its onset meant the rapid termination of the life of the patient. This view-point may hold good even to-day if we were to wait for its diagnosis until the classical symptoms like tenderness and pain, diarrhoea and emaciation manifest themselves. These are not early diagnostic signs but late prognostic omens. They should be considered as late signs of intestinal ulceration, just as bubbling râles and cavities are of pulmonary tuberculosis. If we are not aware of this complication until these late symptoms have been established we are no wiser than our forefathers and the outlook must still remain hopeless. For here, as in pulmonary tuberculosis, the diagnosis to be of any value must be made early and to make an early diagnosis we must consider what may be called the border-line symptoms.

It would be fortunate if there was any pathognomonic sign of intestinal tuberculosis, but unfortunately there is none. The symptom-complex is not constant; in fact, it is quite variable. One may have violent cramps, another only abdominal consciousness; one may have diarrhoea, another constipation; one may have anorexia, another good appetite.

Moreover, some of the gastro-intestinal disturbances may be due to causes other than tuberculous ulceration. (a) They may, for instance, be due to the sedentary life and generous diet employed in the treatment of pulmonary tuberculosis. Over-feeding and other errors in diet

may be responsible for dyspepsia or an inactive life for constipation. The unfortunate tuberculous patient must be pardoned if he suffers from ills not necessarily tuberculous in nature. Davies (1922) has shown that intestinal stasis not infrequently gives rise to gastro-intestinal disturbances and is brought about by the decomposition of foodstuffs and the production of amino-acid derivatives. (b) Diarrhoea may be due to the insufficiency of digestive glands or to the administration of certain drugs for treatment. (c) Amyloid disease of the intestine may cause digestive disturbances particularly diarrhoea. (d) Digestive disturbances may also be due to the toxæmia of pulmonary tuberculosis or be 'reflex' in origin and produced, as shown by Pottenger (1922), by the stimulation of the peripheral ends of the sympathetic and vagus systems.

But all said and done, intestinal ulceration remains the sinister complication of pulmonary tuberculosis and the fight is often fought and won or lost not so much in the lung as on the gastro-intestinal front. Old sayings like 'stomach is the greatest friend of the consumptive' or 'poor eaters do badly' or 'a flux of the bowel leads to a fatal outcome' have apparently been coined to stress the importance of the alimentary tract in the treatment of pulmonary tuberculosis.

Symptoms

The earlier symptoms of intestinal tuberculosis are generally due to lesions in the small bowel; the later to lesions in the large bowel. Ulceration in the small bowel tends to retard the passage; in the large bowel to accelerate it. The earlier symptoms are gradual and slight change from the patient's normal temperament towards nervousness and irritability; from usual and normal appetite towards slight impairment and from usual bowel habit towards constipation. Nervousness, slight impairment of appetite and constipation beyond usual form, therefore, are the early and most useful diagnostic triad. An ulcer in the small intestine produces spasm and it is to this spasm that the earlier symptoms are due. Later, when the large intestine also gets involved diarrhoea with foul-smelling stools results. Constipation is thus a special feature of ulceration in the small bowel while diarrhoea is a symptom of ulceration in the large bowel. Alternating constipation and diarrhoea indicate ulceration in both the tracts.

In order to understand the symptom-complex of intestinal tuberculosis it must be borne in mind that the underlying pathology is an ulcerative enterocolitis. The physiological response to ulceration is increased irritability of the bowel. This increased irritability is manifested by hypermotility. In the small intestine, moreover, ulceration produces spasm. Hence constipation and diarrhoea become important factors. The stools are soft and unformed,

often liquid and may contain mucus, blood or pus.

With ulceration of the intestines comes peritoneal irritation and this results in abdominal pain, abdominal tenderness and abdominal rigidity. The pain tends to come on shortly after eating and may be colicky in character. Tenderness is first noticed over the ileocaecal region and later over the whole abdomen. Similarly, rigidity commences in the right iliac fossa and spreads over the entire abdomen. The mesenteric glands may be palpable in the right iliac fossa or round about the umbilicus. While it is generally true that secondary tuberculous involvement is not accompanied by the enlargement of the regional lymph nodes, this rule does not hold if the infection is sufficiently severe. For this reason the mesenteric lymph glands are sometimes found to be enlarged and even caseous.

As a consequence of the ulcerative enterocolitis certain constitutional signs and symptoms result, such as slight elevation of temperature without any increase in the pulmonary symptoms or failure to improve and gain in weight when the pulmonary lesion is quiescent or shows signs of improvement. Not infrequently the regular curve of temperature in pulmonary tuberculosis becomes irregular and varies from day to day—becomes regularly irregular, if it may be so described. Digestive symptoms also appear such as nausea, vomiting, flatulence, discomfort and change in the bowel habit; for example, a patient who has been constipated shows an increased frequency of stools or a patient who has had normal bowels becomes constipated. In the opinion of Bandelier and Roepke (1913), diarrhoea occurring at night in phthisical patients is very suggestive of intestinal tuberculosis. Owing to the increased irritability of the intestine the food taken early in the day is discharged in the night and the movements continue during the day.

Diagnosis

The methods of diagnosis of intestinal tuberculosis may be discussed under three headings—(a) clinical, (b) laboratory, and (c) radiological.

(a) *Clinical diagnosis.*—The outstanding signs and symptoms have already been mentioned. One thing must be emphasized, namely, the earliest symptoms must be anticipated. There is a wide difference between the normal digestive functions of even healthy persons. Small disturbances in these may easily, therefore, be attributed to lapses on the part of persons from their normal diets and when brought about in patients by tuberculous ulceration of the intestine are considered to be due to a lack of control of the palate. The patient, therefore, fights shy of mentioning them to his physician until they are well established. It is up to the physician and not the patient to be on

the look out for them to make a diagnosis. Similarly, slight deviation from normal temperament towards nervous irritability is attributed to lapses in self-control. When a patient who is usually placid begins to get irritable, nervous and querulous, the physician must think of intestinal tuberculosis as a likely cause. It is an old dictum that disease above the diaphragm makes a patient optimistic while disease below it makes him pessimistic.

(b) *Laboratory diagnosis.*—The laboratory diagnosis of intestinal tuberculosis is notoriously uncertain. The presence of tubercle bacilli in stools is not proof positive of intestinal ulceration in the presence of active pulmonary tuberculosis. The sputum may be swallowed consciously or unconsciously. Women are the worst culprits in this respect. They swallow the sputum deliberately either from indolence or from an aversion to the spitting flask. The presence of pus and blood in stools is presumptive evidence when the patient is suffering from pulmonary tuberculosis and gastro-intestinal symptoms are present. Occult blood when found is a fairly strong evidence but need not be a constant finding. The Triboulet test which indicates the finding of soluble 'allevium' in the faeces has not been found to be specific for ulceration of the intestine. The blood picture usually shows a moderate amount of leucocytosis but this may be due also to the presence of a cavity in the lung. The tuberculin test may cause some increase of abdominal pain but aids little in diagnosis.

(c) *Radiological diagnosis.*—The first worker to use the radiological method in the diagnosis of intestinal tuberculosis was Stierling (Brown and Sampson, 1930) who, in 1911, showed that in ulceration of the ileocaecal region the opaque meal is hurried over this portion of the gut throwing little or no shadow on the film six or seven hours following the ingestion of the meal. Pirie (Brown and Sampson, 1930) in 1917 recorded somewhat similar findings. But no serious attention was given to this method of diagnosis until in 1919 Brown and Sampson (1930) worked out this method of diagnosis by x-raying the alimentary tracts of all patients in the Trudeau Sanatorium.

In this method of diagnosis fluoroscopic observations are made every half-hour or so from the seventh to the tenth hour following the ingestion of the barium meal and finally at the twenty-fourth hour. The patient is instructed not to use any laxative for thirty-six hours prior to the ingestion of the barium meal in order to exclude the possibility of any hypermotility from its use and he is also advised to abstain from eating or drinking anything in the interval between the barium meal ingestion and the first fluoroscopic observation to enable one to estimate the emptying time of the stomach. The barium enema may be given a day or two later to confirm the barium meal findings but is not

absolutely necessary. Films are usually taken when there is most to record, namely, at the seventh, tenth and twenty-fourth hours.

It has already been shown above, that pathologically the caecum and ascending colon form the chief storm-centres of ulceration, at least as far as the large bowel is concerned. A well-rounded smooth-walled caecum still fairly filled after 24 hours with the tail of the meal gives a normal barium appearance to establish a negative diagnosis. On the other hand, a ragged, dwarfed, shrivelled caecum, or a caecum that does not fill or shows filling defects or that empties quickly and seems intolerant of barium nearly decides the diagnosis. Variations at the right or ascending side of the large bowel are more significant than at the left or descending side. Gastric retention suggests irritation lower down in the small intestine. Segmentation in the lower part of the ileum suggests damming due to ulceration and consequent spasm.

The findings of Brown and Sampson may be summarized as follows:—

(a) General hypermotility with complete or nearly complete emptying of the colon in 24 hours.

(b) Failure of the caecum or of the ascending colon and hepatic flexure to retain the barium.

(c) The presence of spasm or spastic filling defects, irregular contour and absence of haustrations in the ascending colon.

(d) Segmentation of the coil of small intestine with or without dilatation of the coils.

(e) Ileal stasis and gastric retention.

It is important to remember that these findings indicate only the presence and not the nature of ulceration. While hypermotility may be present in other conditions also, its combination with filling defects confirms the presence of ulcerative condition of the intestine. In the presence of active pulmonary tuberculosis the tuberculous nature of these ulcers may be inferred with some degree of certainty. Moreover, other types of ulceration do not occur primarily in the ileocaecal region. The absence of hypermotility and filling defects excludes for practical purposes the presence of tuberculous colitis, unless of course the condition has already healed up.

Differential diagnosis.—Since the direct diagnosis of intestinal tuberculosis is based on the evidence of hypermotility of the intestinal tract, mistakes are likely to be made and the differential diagnosis must be made from other pathological conditions which give the same results. Gauss, Singerman and Black (1933) have discussed the differential diagnosis from the following conditions:—(1) protozoal infections, (2) bacterial infection of the colon, (3) tumours of the intestine, (4) disorders on the formation, position and configuration of the colon, (5) subacute and chronic appendicitis, (6) digestive disorders like achylia gastrica, or

pancreatic insufficiency, (7) nutritional disorders like pernicious anæmia or pellagra, (8) blood dyscrasias like myelogenous leukæmia, (9) endocrine disorders like hyperthyroidism or Addison's disease, (10) cardio-renal disease, (11) industrial poisons like lead and arsenic, (12) surgical complications like nephrectomy or adhesions and (13) rectal disorders like proctitis and fissures.

A careful consideration of the clinical features together with the x-ray findings and other necessary tests will, in most cases, differentiate the above conditions from intestinal tuberculosis.

The importance of x-ray in the diagnosis of intestinal tuberculosis cannot be denied. In a proverbially poor country like India, however, the radiological method of diagnosis cannot be employed as a routine measure for the simple reason that it is too expensive for the average patient. Moreover, there are still few facilities for x-ray in this country. This does not mean that x-ray should not be employed wherever it is possible to do so, but considering everything greater importance should be attached to physical signs and symptoms.

Treatment

General measures.—As soon as the diagnosis of intestinal tuberculosis is made, certain general principles must be observed. The patient should be told to rest in bed as exercise may stimulate the peristaltic movements of the bowels. The rest should be continued as long as active bowel symptoms are present and for some time after. If the lung lesion is active a serious attempt should be made to bring about a successful control of the pulmonary condition to obviate the possibility of reinfection of the intestinal tract from this source. The patient should be advised to use constantly an abdominal binder covering the whole of the abdomen. This keeps the abdomen warm and protects it from catching chill. Similarly, chilling of the feet should be avoided as it has also been found to act adversely.

Dietetic treatment.—Tuberculous intestine, like any other organ affected by the disease, requires rest. It has been found that in patients who have an irritable bowel the mere act of eating produces reflex peristalsis of the terminal ileum and colon, quite independently of the nature of food taken. Distension of the bowel tends to stimulate the peristaltic movements: consequently food that causes fermentation such as peas, beans, cabbages, potatoes, should be excluded. Milk also causes flatulent distension and diarrhœa in some patients and has to be stopped. Experience has shown that raw eggs sometimes give rise to loose motions. Raw white of the egg is not digested easily and has been found experimentally to stimulate only partly the flow of the gastric juice. On the other hand, cooked white of the egg is easily digested and

well utilized by the economy. In the opinion of Fishberg (1922), as long as eggs are not consumed raw they make an excellent food for the tuberculous patient. Foods which leave a good deal of residue in the bowel irritate the ulcerated mucous membrane and cause diarrhœa; such foods should be stopped. Alvarez (Brown and Sampson, 1930) has advocated the smooth, cellulose-free diet which aims at supplying the necessary nourishment with the least amount of work and irritation to the intestine. It is small in bulk, high in caloric value, fairly varied, easily prepared, palatable and easily assimilated. With cellulose mainly removed the starches are acted upon more freely. If bulk is needed agar can be added. It seems to lessen flatulence, discomfort and bowel irregularities. Lean meat is the basis of the diet.

In a vast country like India, the selection of diet for a consumptive is a very difficult problem indeed. Normal diets vary with different provinces and many are strictly vegetarians. It is well known that the proteins of vegetable origin are not easily assimilated and vegetable food leaves a great deal of residue behind which stimulates peristalsis.

Lassabliere (1922) has recommended a diet exclusively of sweetened condensed milk diluted with four parts of rice water of which a teacupful is taken every two or three hours, one or two litres being taken in 24 hours. No other food, liquid or solid, has to be taken. The number of stools are said to be reduced in two or three days after which other ingredients may be added gradually to the diet.

Morriss (1924) has found bacillus-acidophilus milk treatment first described by Rettger and Chaplin of great therapeutic value. He has given one pint of milk with 50 grammes of lactose daily with satisfactory results. Sufficient care has to be taken in regulating the quantity of milk and of lactose. In India, sour milk, in the form of dahi, butter-milk, etc., has been used extensively from time immemorial and proves satisfactory where pure milk does not agree with the patient. Bernard Fantus (1934) has described the raw apple diet for diarrhœa. Thoroughly ripe apples are converted into a pulp and taken raw—1 to 4 tablespoonfuls being taken every hour or two for 48 hours, during which period no other food or medicine is taken. Banana pulp may be added if the apple pulp alone is refused. This is followed by a transitional diet consisting of soup, cooked cereal without milk, toast, potato gruel, cocoa or tea without milk, etc., for another 48 hours, after which milk, vegetables and fruits are added to the diet. The pectin content of the apple is supposed to form a colloidal absorbent mass which absorbs the toxins and the amines and produces good results.

Heliotherapy.—Heliotherapy has been used successfully for several years by Rollier (1927)

in the treatment of surgical tuberculosis. Its value in the treatment of intestinal tuberculosis could not be established as long as no definite method of diagnosis was known in order to decide when the disease in the bowel began or whether or not it was at all present. The *x*-ray method of diagnosis has, however, made it possible to employ heliotherapy in the treatment of intestinal tuberculosis. Heliotherapy may be natural or artificial; the latter is preferable because it contains pure ultra-violet rays while with the former are associated the luminous rays also. For artificial heliotherapy the carbon-arc lamp or mercury-vapour lamp may be employed. The mercury-vapour lamp is, however, simpler to use and can be controlled by the patient himself. Advantage must, of course, be taken of the sun's rays in the absence of an ultra-violet ray lamp.

Limited areas of skin are first exposed to the ultra-violet rays for short periods and then the time of exposures and the extent of the skin exposed are gradually increased in order to avoid severe local or general reactions. It is said that patients whose skin becomes pigmented easily have a better prognosis. The results of treatment by heliotherapy have been reported to be quite satisfactory. Pain, nausea and vomiting are quickly relieved but diarrhoea and digestive disturbances take some time. Better results are said to be obtained when the treatment is commenced soon after the symptoms manifest themselves.

When the desired results are not obtained by heliotherapy, *x*-ray treatment of the intestinal tract has been advocated. Great care has however to be taken in the use of *x*-ray as it has been shown experimentally that the intestinal mucous membrane is very susceptible to hard and short *x*-rays.

Tomato juice and cod-liver oil treatment.—During his trip to America in 1930, the writer (1931) was much impressed to find that tomato juice and cod-liver oil were being employed on a very large scale. This method of treatment is the result of experiments carried out by McConkey (1930) who discovered that it was necessary to have a deficiency of vitamin C in diet in order to produce intestinal tuberculosis in experimental animals. McConkey thought that since heliotherapy and cod-liver oil are equally efficacious in the treatment of rickets and since intestinal tuberculosis can be treated successfully by heliotherapy, it was not unreasonable to expect equally good results from the use of cod-liver oil. Cod-liver oil alone has an unpleasant taste and upsets many patients, but the combination of tomato or orange juice with the oil gave better results. McConkey believes that the treatment affects some change in the calcium metabolism which brings about immediate relief of symptoms and the healing of ulcers. The treatment is very simple—half an ounce of cod-liver oil in three ounces of fresh

tomato juice is taken three times a day immediately after the principal meals. An average-sized orange may be substituted for tomato juice. According to McConkey, this treatment is more economical than artificial heliotherapy and may also prove a means of preventing intestinal tuberculosis in pulmonary cases. As we know, cod liver contains vitamins A and D and tomato or orange juice contains vitamin C. The treatment is, therefore, a simple high vitamin diet treatment. Our experience with this method of treatment has, however, not proved very encouraging perhaps because the patients treated with it were already on a diet rich in fresh vegetable produce and fatty material.

Medicinal treatment.—Drugs of almost every kind have been used in the treatment of intestinal tuberculosis, such as, antiseptics, astringents, sedatives, and opiates, but they have been used more for the relief of symptoms than for the cure of the disease. The list of these drugs is very long and is ever increasing, but the fact that we have a thousand and one remedies speaks more loudly than words for their failure as a 'cure'.

Jacquelin (1924) has described certain simple procedures such as reaction to litmus paper, time taken for food to pass through the alimentary tract, microscopical examination of stools, etc., in order to determine the type of enteritis present and to treat the condition accordingly. He has classified diarrhoea into four groups requiring different methods of treatment:—

(1) *Simple enteritis* accompanied by fever and coated tongue. Treated by dieting, gentle saline purgation and intestinal antiseptics, especially lactic ferments. Treatment not to be kept longer than is absolutely necessary.

(2) *Diarrhoea associated with hyper-functioning of stomach, liver and pancreas* best treated by pepsin, pancreatin and sodium bicarbonate at meal times and small doses of hydrochloric acid after meals. At other times powdered charcoal, prepared chalk and powdered nuxvomica may be taken.

(3) *Putrefactive or fermentative diarrhoea* treated by lessening the intake of carbohydrates and of meat and eggs.

(4) *Ulcerative enteritis* characterized with abdominal pain, the presence of blood, albumin in the stools and by its intractable character. This is the tuberculous type of enteritis and is treated with antiseptics, astringents, sedatives, kaolin, calcium chloride injections, opium, etc.

Treatment of important symptoms

(1) *Diarrhoea.*—(a) Calcium chloride has been used extensively and is best given by the intravenous route. The usual dose is 5 c.cm. of a 5 per cent solution, given once or twice a week, but it may be used more frequently and in greater concentration according to the necessity of the case. It is believed that calcium

chloride acts on the vegetative nervous system and decreases the peristaltic movements by reducing the irritability of the smooth muscle of the intestinal wall and thus gives rest to the affected part. It also gives relief to pain and bleeding.

(b) *Castor oil* yields good results in some cases. Davies (1922) has spoken of the 'charm' of castor oil in the treatment of intestinal stasis. Sodium ricinoleate has been used in place of castor oil with better results, probably because it is free from disagreeable and nauseating taste and is therefore capable of being administered for as long a time as desired. It maintains the normal intestinal gradient, reduces toxæmia and relieves symptoms without producing unnecessary purgation.

(c) *Bismuth and astringents and their combinations* have been used. Substances containing tannic acid usually affect the stomach slightly, but with the alkaline reaction of the intestine, they precipitate the proteins and so protect the mucous membrane which is thus less stimulated and peristalsis is lessened. The mucus may be reduced and fermentation hindered.

(d) *Certain inert powders*, like animal charcoal and kaolin, are prescribed for coating and protecting the mucous membrane and for the absorption of gases.

(e) *Antiseptics*, like creosote, iodoform, dimol, benzonaphthol, methylene blue, have all been used.

(f) *Opiates* are resorted to when other remedies fail in checking diarrhoea.

(g) *Enemata*, either of saline alone or combined with tincture of opium or one of the silver preparations, have been found to give relief in some cases. Starch and opium enema may have to be tried. It must not be forgotten that many patients feel better when the bowels are loose.

(2) *Constipation*.—Liquid paraffin, castor oil and other mild laxatives are used. Several patent medicines, like paragol, petromol, petrolagar, are available in the market. Kaylene-ol, a combination of kaolin and liquid paraffin, has been found to be very useful in the writer's experience.

(3) *Pain*.—Calcium chloride injections are supposed to give relief. If pain persists, hot fomentations, hot wet compresses, turpentine stupes, antiphlogistine, etc., may be applied externally over the abdomen. Internally, benzyl-benzoate, atropine, opium may be given. Ispaghula has been found to give great relief to intestinal symptoms and is used extensively in this country. Spigel seeds contain, as we know, much mucilage and are given in the form of cool demulcent drinks for pain and diarrhoea.

Surgical treatment.—Surgery has a very limited field in the treatment of secondary tuberculosis of the intestine. For the operation

to be of any value the ulceration must be confined to a limited area so that the diseased portion of the bowel may be excised with some hope of success. Short-circuiting operations have been tried but not with any great success.

The injection of oxygen in the peritoneal cavity has been advocated and satisfactory results reported. The technique is practically the same as that employed for artificial pneumothorax. McBurney's point is selected for the injection and 300 to 500 c.cm. of oxygen are injected after anaesthetizing the needle tract, including the peritoneum, with novocain solution. The intervals between the injections vary from one to three weeks depending upon the condition of the patient.

Prognosis

The occurrence of persistent diarrhoea in a phthisical patient has always been regarded as of grave significance. The old Hippocratic saying 'diarrhoea attacking a person with phthisis is a mortal symptom' has been held valid until very recently. Autopsy figures show that intestinal tuberculosis occurs in from 50 to 80 per cent or even more of all cases of pulmonary tuberculosis. It has been estimated by Drolet (Brown and Sampson, 1930) that about 18,000,000 patients have died from pulmonary tuberculosis throughout the world during forty years; of this number, from 9,000,000 to 14,000,000 had intestinal tuberculosis. It is doubtful if these figures include the mortality figures from India where no reliable and accurate statistics are available and the mortality from pulmonary and intestinal tuberculosis must necessarily be very great. Intestinal ulceration would appear to be more common and more severe in Indian patients because the people of this country have not yet developed that amount of racial immunity which people in the West have done. The prognosis is, therefore, more serious in Indian patients.

The prognosis of intestinal tuberculosis is determined by the character of the disease in the lungs; in other words, the amount of tuberculous enteritis is directly proportional to the degree of activity in the lungs. It has been found that healing in the intestine is much more frequent in the productive type of pulmonary tuberculosis than is the case in the exudative form. The explanation for this probably lies in the fact that the intestine reacts slightly or vigorously in proportion to the number of tubercle bacilli swallowed with the sputum and this factor is largely governed by the character of the pulmonary lesion. It will thus appear that factors like the number of bacilli swallowed with the sputum, the condition of the patient and his vitamin balance in the diet are controlling factors in the production of intestinal tuberculosis.

If the diagnosis of intestinal tuberculosis were made in good time, if the general condition of

the patient is good and if the pulmonary condition is not in an advanced stage and if the patient is placed under proper and prolonged treatment at this time, the prognosis would be brighter. Tuberculous lungs heal; tuberculous lesions of the intestine tend also to heal and can be shown by barium meal to have healed. At the same time, the difficulty which attends the healing of severe widespread infection in the intestinal wall, particularly when frank ulceration has taken place, must be quite evident. The surface of the ulcers is constantly bathed in irritating mixtures of digestive juices and food in various stages of digestion which produce more or less maceration of the tissues and retard healing. When, therefore, the ulceration is widespread and the pulmonary condition is far advanced and the general condition of the patient is poor, little can be hoped for except amelioration of the symptoms. In such cases the intestinal lesion only hastens the inevitable end. The prognosis of intestinal tuberculosis, therefore, depends, as in pulmonary tuberculosis, upon early diagnosis and proper treatment. We are still making the diagnosis at a late stage. By methods we now have at our command we can make it much earlier and if we do this there is no reason why intestinal tuberculosis should not yield to treatment just as pulmonary lesions do.

Prevention

'Prevention is better than cure' is an old adage which is nowhere so true as in intestinal tuberculosis. The prevention of intestinal tuberculosis depends upon the early diagnosis and treatment of pulmonary tuberculosis. Patients should be warned against swallowing the sputum, which they do from ignorance, from indolence, or from aversion to the spitting flask, as this is the chief source of infection of the intestinal tract. When one remembers that no matter how great the care taken patients, suffering from open lesions in the lung, swallow bacillus-bearing sputum daily and often in large quantities, the relatively greater danger to the patient from his own sputum as compared to the danger from bacilli coming from without must be quite evident. In suitable cases of pulmonary tuberculosis artificial pneumothorax should be induced, to make the sputum free from tubercle bacilli. Constipation should be avoided and any catarrhal condition of the bowel should be immediately treated. Patients suffering from deficiency of hydrochloric acid in the stomach should be given this acid regularly as it has been found that in such cases the ulceration takes place higher up in the bowel. The general resistance of the patient to infection should be built up by suitable diet and particularly by a proper supply of necessary vitamins. The importance of cod-liver oil and tomato juice in the prevention of the disease has already been mentioned. Here is some work

for the King George Thanksgiving (Anti-tuberculosis) Fund to do. While educating the public against the bad habit of spitting in public places, it must also point out the danger from swallowing the infected sputum. The degree of danger to the intestine to which the patient suffering from open pulmonary tuberculosis is constantly exposed as compared to others, is not generally appreciated and must be brought home to the public by the Fund. It is believed that tubercle bacilli are more easily absorbed through the intestinal mucous membrane when ulceration is present in it. In such cases, reinfection of the lung through the blood may take place. The marked improvement, noticed in the lungs of some patients who are recovering from intestinal tuberculosis, lends support to the view that ulceration of the intestine is a frequent cause of reinfection of other parts of the body including the lungs. Hence the additional danger of what may be called 'entero-phthisis'.

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CORRIGENDUM

We regret that a serious misprint was overlooked in Captain A. T. Andreasen's paper on 'The Etherington-Wilson Technique of Intrathecal Nerve-Root Block' which appeared in our December issue, on p. 683, second column, second line, under the heading *Practical details*, the figures '1:500 solution' should read '1:1500 solution'.

We suggest that subscribers make this correction in their December number immediately to obviate a mistake in dosage being made by themselves or others at some future date.



In Memoriam

SINCE our last number was issued His Majesty King George the Fifth of England, Emperor of India, has died.

Most of us must feel that in losing our King-Emperor we have sustained a personal loss. In the history of the world there has been no sovereign so well known and so well loved by his many millions of loyal subjects.

To the medical profession in particular King George had endeared himself. Seven years ago, during his serious illness, for King George as a patient, we all experienced that special feeling of sympathy that a doctor has for any sufferer and although we felt a little justifiable pride that members of our profession had steered him safely through the grave dangers of pneumonia in a man of his age, yet no one realized better than we how much depends on the courage and will-power of the patient himself on such an occasion.

King George always took the greatest interest in all medical institutions and activities, and his recent great benefactions are characteristic of his attitude towards the sick and indigent among his subjects. When large sums of money were collected in this country, first as a thanksgiving for the King's recovery from his illness and again later to commemorate his twenty-five years' reign, instead of allowing this money to be used for erecting some majestic memorial in cold marble which might have stood as a monument to his greatness for a thousand years, he was content to build a memorial in his subjects' hearts by directing that this money should be devoted to the sick of the present generation.

We have lost a great King, a very sincere friend and a great patron of our art to whose memory we shall always pay tribute.

Indian Medical Gazette

FEBRUARY

JHIN-JHINIA, OR NEUROMIMESIS?

CHRISTMAS of 1935 has brought to medical practice in Calcutta the enlivening stimulus of a new 'disease' to ruffle the even tenor of our existence in a land where the routine of malaria, cholera, dysentery and kala-azar is seldom disturbed by anything more exciting than an outbreak of epidemic dropsy or cerebro-spinal meningitis. Though we shall allow them to remain, lest their absence lead to a misinterpretation of our attitude towards this new 'disease' we find, on referring to the *Shorter Oxford English Dictionary*, that the inverted commas we have used are unnecessary; the first meaning of the word *disease* is 'absence of ease, uneasiness; inconvenience, annoyance; disturbance; trouble—1623; a cause of discomfort—1712; molestation—1493'. A more accurate description of the *jhin-jhinia* epidemic that is raging in this part of Bengal could scarcely be given.

The 'disease' appears to have broken out first in September in a village some 50 miles from Calcutta, and though it became a popular local tradition, it does not seem to have attracted much medical attention until the middle of November.

At this point the provincial health authorities were informed of its existence and proceeded to investigate it. At the same time the attention of the daily press was attracted and fantastic stories regarding the disease were published in some of the newspapers, both vernacular and English, in the province. Coincidentally with wider publicity, the 'disease', which had hitherto only spread slowly from village to village, acquired powers of more rapid dissemination. We were warned by frequent alarming reports that the disease was rapidly approaching Calcutta and in due course it arrived—just about Christmas time.

For those who are not familiar with the 'disease', we should perhaps at this point describe some of the symptoms. There was one symptom that was absolutely constant; that was a tingling sensation of the sole of the foot or feet, usually of the big toe. The 'disease' derived its name from this symptom (the Bengali *jhin-jhin* means tingling), and without it no combination of symptoms was *jhin-jhinia*! Another symptom was a feeling of pressure in the head with or without actual headache, and the third pathognomonic sign

which completed the syndrome was violent trembling of the whole body. The last sign, though one of frequent occurrence, was usually delayed until 'treatment' was undertaken—but as everybody knew what treatment was indicated, namely, continuous drenching with cold water, it was seldom that the symptom-complex was allowed to fall short of its full development!

The understanding of the physiology of the disease required a knowledge of Newton's laws of gravity, but little else. According to the local tradition, the 'disease' was caused by a perverse tendency—not fully explained—of the blood to run away from the feet and into the head, hence the tingling due to ischaemia of the toes and the sense of pressure and headache due to congestion.

The rationale of the treatment was even more direct; in order to reverse the flow, the patient was tied to a post to prevent him, or more often her, from lying down—an action that would lead to disastrous consequences—and cold water poured over the head. A not uncommon complication, or sequela, and one that proved fatal in a few cases, was pneumonia; and this complication occurred in those that had received the most thorough and prolonged 'treatment'—an indication of the malignancy of the disease, it is claimed!

The epidemiology of the 'disease' is interesting; it is apparently extremely contagious! The incidence of one case in a village is rapidly followed, often within the hour, by other cases, and the arrival from an 'infected' village of a clerk at a jute mill led to the occurrence of 28 cases on the following day. Another peculiarity of the disease is that the attack usually comes on when the patient is in a crowded place, seldom when he is in his own home, and in Calcutta the highest incidence occurred in the markets whilst the patient was quietly listening to stories of other people who had been similarly attacked.

Most of the victims knew immediately when they were attacked as they had either seen other instances of the disease or the symptoms had been described to them by friends or relatives who had been in contact with the 'infection'; this provides strong presumptive evidence that carriers play a part in disseminating the virus. Deaths have of course been reported; these have apparently been due rather to the complication than to the disease itself; the actual causes of death in these instances have been varied, cerebro-spinal meningitis, apoplexy, fractured skull, and pneumonia following prolonged immersion being amongst those reported.

Encephalitis lethargica, chorio-meningitis, meningitis aseptica and even Landry's paralysis

have been suggested as the diagnosis of this epidemic disease. The fact that most of the cases have been mild and that few deaths have been reported must not, we have been told, make us take the matter lightly, as even the most serious diseases exhibit mild manifestations in some people, and the exponents of the neo-Sydenham school of epidemiological thought warn us that these may only be the 'aura' of a much more serious epidemic.

A number of cases of *jhin-jhinia* have been admitted to the larger hospitals in Calcutta and investigations have been carried out. Those that were not suffering from some definite organic disease showed no symptoms, either subjective or objective, when they had once recovered from the drastic treatment that they had received outside; nevertheless, they were in many instances submitted to a very thorough examination; unimportant abnormalities, such as a high eosinophil count, which could be accounted for by a hookworm infection, and exaggerated knee jerks were found in some of them, and, in about half the cases in which lumbar puncture was done, the spinal fluid came out under slightly increased pressure; otherwise clinical, bacteriological and biological tests showed no pathological deviations from the normal.

After studying this 'disease' from an epidemiological and a clinical point of view it is very hard to escape the conclusion that in the vast majority of cases the diagnosis is neuromimesis or, in the words of the dictionary, 'the hysterical simulation of organic disease'. To be able to say that the whole *jhin-jhinia* epidemic was the result of mass suggestion amongst an ill-educated population would necessitate an omniscience to which no one can lay claim, as it is possible that there is underlying this hysterical display an epidemic of mild but unusual nature in which the transient nervous manifestations are prominent symptoms. Any real evidence for the existence of such an epidemic is, however, lacking. The symptoms that have been described are unlike those of any recognized disease and do not constitute a symptom-complex that could be fitted to an infection or lesion of any particular part of the nervous or any other system. The frequency with which certain subjective symptoms occur has been cited as evidence of a common pathology and of the epidemic prevalence of some infection, but, as an officer in charge of one of the larger Calcutta hospitals pointed out, the constancy of the initial symptoms is one of the strongest pieces of evidence in favour of the hysterical nature of this syndrome, as such a degree of constancy is unknown in the onset of any organic disease. However, it is still necessary to keep an open mind and to investigate any cases in which the symptoms are more definite and less transitory.

The panic that was created was very considerable, and, though the incident has had its comic side, it has also had its serious one. Fear alone is a predisposing cause of disease, and the severe treatment that was administered was in many cases a determining one. The legitimate work of the hospitals in Calcutta was interrupted by the steady flow of *jhin-jhinia* cases, all of which required individual attention as there was always the risk that some real organic condition might be masked by the hysterical manifestations, and the city ambulances were kept busy day and night. The opportunists have not been slow to improve the occasion; *jhin-jhinia* cures and prophylactics are advertized freely, and healers of the cure-guaranteed school have been busy, and have no doubt done a great deal of good in their own way.

Fortunately, the Government took a wise step at an early date; the Hon'ble Minister, Sir Bijoy Prasad Roy Singh, called a conference of representatives from the leading hospitals and issued a communiqué which has done much to quell the panic.

The whole incident does not reflect very great credit on the local medical practitioners and the local health authorities where the 'epidemic' started. They seem to have accepted hearsay reports too readily, instead of doing a little personal investigation, to have looked up in textbooks and journals details of obscure nervous diseases, instead of applying a little common sense, and to have been too keen to display their erudition by writing reports, issuing warnings through the press, and suggesting elaborate procedures for treatment, instead of attempting to allay the panic by pointing out that the attack, whatever it was, was of short duration and of a quite harmless nature. To certain sections of the press also must be attached some of the responsibility for the panic (and we have little doubt that they will attempt to justify their scare-mongering by maintaining the tradition), as they published very misleading details, issued unnecessary and ridiculous warnings, and made the topic one for daily double-column headings.

Returning to our original contention, we feel that we have justified the use of the word *disease* on many counts, but to justify 'molestation—1493' it will be necessary to recount an incident that happened at the height of the 'epidemic'. A citizen was peacefully walking along one of the main streets in Calcutta when he was suddenly accosted by four men who accused him of having *jhin-jhinia* and, despite his protests, rushed him to a water tap near by, poured buckets of water on him, and then decamped; when their victim had recovered he found that his wallet which had contained a hundred rupees was missing!

Medical News

THE SOCIETY OF BIOLOGICAL CHEMISTS, INDIA

BIOCHEMICAL AND ALLIED RESEARCH IN INDIA IN 1934

THIS publication which has just come out covers a little over a hundred pages. It is an annual publication that attempts to summarize the various research work carried out in India on biochemical and allied problems. The subjects discussed come under the following headings:—enzymes, agricultural chemistry, foods and nutrition of farm animals, dairy chemistry, vegetable physiology, phytopathology, progress of research on nutrition in India including work on vitamins, biological chemistry in relation to pathology, pharmacology and therapeutics, and chemistry of sanitation. As in other annual reports of a similar nature, the different sections have been summarized by different contributors. A few duplications may be observed here and there but they can be avoided by a careful scrutiny of the summaries received from the contributors by the committee of publication. A few other shortcomings, such as the omission of a subject index, the choice of the subject headings, the prominence given to the names of the authors, the want of proper sequence of subjects under each heading, etc., will, it is to be hoped, disappear in future.

An interesting feature of the publication is the attention given to medical and agricultural problems, subjects which are of vital importance to India. For a vast country like that of India, with ever-increasing centres for research work, a publication like this should be welcome to everyone. It will not only co-ordinate the different types of work carried out in this country, but will act as an incentive to the workers in different centres. For a scientist, busy with his extremely specialized work, with little time to go through the growing mass of publications, even within India, it should prove to be a welcome addition and help him to keep in touch with the recent developments of a new but rapidly-growing science, the science of biochemistry.

S. G.

BERRY-WHITE MEMORIAL

THE following speech was delivered by Dr. B. Dey, L.M.P., on the 26th October, 1935, when the Students' Union of the Berry-White Medical School celebrated Founder's Day:—

'Mr. President and Gentlemen,

We have met here to-day under the auspices of the Re-Union and Founder's Day Committee to deliberate upon the ways and means of serving humanity as best we can.

As a member of the Re-Union I venture to take the liberty of diverting your attention to a matter which is of no less importance.

It has become customary with us to observe the Hospital Day and the Founder's Day, when a meeting is convened, lectures delivered, a procession through the town of Dibrugarh organized, and money collected for the Hospital Fund.

Many people are quite ignorant of the significance of the Founder's Day. Who the founder was, and what was the extent of his sacrifice for this noble institution, the Berry-White School of Medicine? 16th November, 1896, may well be called a red-letter day in the annals of the medical education of the Assam Province.

It was on this day that Brigade Surgeon John Berry-White, of revered memory, bequeathed to the Charitable Hospital, Dibrugarh, the sum of Rs. 50,000 to be applied towards founding the medical school in Dibrugarh for the instruction of youths who are natives

of India and one of whose parents, at least, is a native of or has for the space of 10 years been resident in the province of Assam.

The Dibrugarh Medical School, and for the matter of that the majority of the members of our service in the province, owes its existence to the magnanimity of this large-hearted and philanthropic Brigade Surgeon.

Mere naming of the medical school after him or observing the Founder's Day in my opinion is not a suitable recognition of greatness of the departed soul, but we must do something more to keep his memory ever green in our mind.

Besides observing Founder's Day, I propose that a memorial fund in the name of the founder may be started, and all the students and ex-students of this school may be appealed to contribute their mite. It may continue till the fund is sufficiently developed when it may be utilized in procuring a statue, or a bust, or a life-sized oil painting of the founder, as the fund permits, to be placed in the medical school, with a brief history of the fund inscribed in a marble tablet. This will be a source of inspiration to anybody who might come across the statue and know more about the man.

We would be failing in our duty if we do not worship the heart that was so great and imbibe the spirit of his soul.

By honouring the great, we also will feel ourselves highly honoured.

With these few words, I again appeal to my fellow brothers to give their serious thought to my humble suggestion and come to a favourable decision.

We understand that the suggestion was readily accepted and Rs. 300 immediately subscribed to create the memorial fund.

It is hoped that all ex-students and others will subscribe to the fund. Money collected will be deposited in the savings' bank at the Dibrugarh post office. A committee has been formed and all information will be supplied on request by the President, Students' Union, Berry-White Medical School, Dibrugarh, Assam.

WORKMEN'S COMPENSATION PAMPHLET

WE have received a copy of the fourth and revised edition of a special pamphlet entitled **WORKMEN'S COMPENSATION IN INDIA** containing 'NOTES FOR THE INFORMATION AND GUIDANCE OF EMPLOYERS AND INSURANCE AGENTS', recently published by the Calcutta Claims Bureau, 26, Dalhousie Square, Calcutta. This pamphlet, which is similar in design to the previous editions, now contains further details and comments regarding the Workmen's Compensation Amendment Act which came into full force in British India, with effect from 1st July, 1934.

The following, among other items, are dealt with:—scope and persons protected; employees included within the definition of 'workman'; civil suits for damages; what is accident; compensation for disease; what accidents are included; amounts of compensation payable for death, permanent disablement and temporary disablement; the 'waiting period'; notice of accidents; reports of fatal accidents; liability for contractors' employees; penalties; administration by commissioners; insurance facilities; cover provided; and procedure in handling claims under the Act.

Written in simple language free from technicalities, the pamphlet should prove of great interest and assistance to all employers who may be called upon to pay compensation and also to legal practitioners and injured workmen themselves who may have recourse to the provisions of the Act.

Workmen's Compensation has already assumed considerable importance in this country, since the first introduction of the Act in the year 1924, and now concerns employers and employees in practically all forms of organized industry. Following the recommendations of the Royal Commission on Labour, the original Act

was materially amended in the year 1934 when numerous additional classes of employees were brought within its scope and the scales of compensation were increased, the increases in the cases of the highest and lowest paid employees being in the vicinity of 100 per cent. The 'waiting period' during which no compensation is payable was reduced, penalties were introduced for the first time, for failure, on the part of the employer, to submit certain reports and returns as required, and there was a general 'tightening up' of all the provisions in the Act in order to avoid evasion of liability.

Many employers will desire to know exactly their legal position in cases of injuries or deaths caused by earthquakes and other similar catastrophes of nature, deaths and injuries caused by attacks of wild animals, including snakes, death due to heart failure following the strain of ordinary work and also their liability in cases of certain diseases, such as those specified as 'occupational diseases', or where diseases, such as pneumonia and tuberculosis, are contracted in accidental circumstances.

The pamphlet deals with these various points in simple language and in the manner which can readily be understood by a layman.

The scheme adopted by insurance companies in connection with the grant of indemnity to cover employers' liability to pay compensation under the terms of the Act is also fully dealt with, samples of the proposal and policy forms being included. The Calcutta Claims Bureau, which was organized when the present Act was introduced in the year 1924 by practically all the leading insurance companies operating in India, acts on their behalf in the settlement of the claims arising under the policies issued by those companies.

The details contained in the pamphlet may, therefore, be regarded as authoritative and based upon the experience gained in the handling of a very large volume of claims since the Act was first introduced. Copies of the pamphlet may be obtained, at a nominal cost, on application from any of the leading insurance companies operating in the Calcutta area.

THE PARKES MEMORIAL PRIZE, 1935

SURGEON-LIEUTENANT J. L. S. COULTER, Royal Navy, has been awarded the Parkes Memorial Prize for the year 1935, a gold medal and a sum of £30, for his essay on 'Tropical Service in the Royal Navy'.

The Parkes Memorial Prize is awarded annually to the writer of the best essay on a subject connected with Naval or Military Hygiene.

The competition is open to medical officers of the Royal Navy, Army, and Indian Army, with the exception of the professors and assistant professors of the Royal Naval Medical School, Greenwich, and of the Royal Army Medical College, London, during their term of office.

THE INDIAN HONOURS LIST

1ST JANUARY, 1936

THE following are the names of medical workers in the Indian Honours List of date 1st January, 1936. We offer them our congratulations:

Knighthood

Colonel C. I. Brierley, lately Inspector-General of Civil Hospitals and Jails, N.-W. F. P.

M. V. Mehta, Medical Practitioner, Bombay.

C.I.E.

Lieutenant-Colonel W. Ross Stewart, Surgeon to Viceroy; Major R. S. Aspinall, Civil Surgeon, Ajmere Merwara; Dr. James Cairns, Chief Medical and Health Officer, N. W. R.

C.B.E.

Lieutenant-Colonel A. M. Dick, Professor of Ophthalmology, King Edward Medical College, Lahore.

M.B.E.

K. S. Sethna, Health Officer, Delhi Municipality.

Kaiser-i-Hind Medal

First Class

R. N. Parmanand, Chief Medical Officer, Adams Wylie Memorial Hospital, Bombay.

Kaiser-i-Hind Medal

Second Class

Miss H. M. Lazarus, Principal, Lady Willingdon Medical School, Madras; Miss C. J. Oliver, Nursing Sister, Lady Minto's Indian Nursing Association, New Delhi; Mrs. E. Sims, Matron, British Families Hospital, Mingaladon, Burma; Mrs. L. Tarleton, Superintendent, Jaswant Female Hospital, Jodhpur; Miss Alice Wilkinson, Nursing Superintendent, St. Stephen's Hospital, Delhi; Girdharilal Batra, Assistant Director of Public Health, Bengal; N. A. Pitale, in charge of Naini Leper Asylum Laboratory, Allahabad.

Kaiser-i-Hind Medal

Third Class

Mrs. C. E. M. Gillespie, Matron, Victoria Hospital, Jubbulpore; George Henderson, Medical Missionary, Sankeshwar, Belgaum; J. D. Gupta, Sub-Assistant Surgeon, Sadar Hospital, Jessore; S. K. Galvankar, Medical Practitioner, Bassein, Bombay; S. R. Jawadekar, Private Medical Practitioner, Jamner, East Khandesh, Bombay.

Sardar Bahadur

Sardar Sahib Sardar Lehna Singh, Sub-Assistant Surgeon, Abohar, Ferozepore District; Sardar Ragbir Singh Dugal, Private Medical Practitioner and Managing Director, Sports Syndicate Limited and Councillor, Municipal Corporation, Rangoon; Rai Sahib Subedar Mula Singh, I.O.M., First Assistant to Director, Nutritional Research, Indian Research Fund Association, Coonoor.

Rai Bahadur

Rai Sahib Kumar Nath Bagchi, Chemical Analyst to Government of Bihar and Orissa, Public Health Department, Patna; Babu Baikuntha Kumar Nandy, Habiganj, Sylhet, Assam; Hukum Chand Gupta, Civil Surgeon and Superintendent of Jail, Kohat.

Rao Bahadur

Dr. Ramchandra Venkatesh Mone, Civil Surgeon, Bijapore, Bombay Presidency.

Rai Sahib

Babu Mahesh Prasad Mehra, Medical Officer, Khairabad Dispensary, District Sitapur; Lala Bansi Lal, Sub-Assistant Surgeon (retired), Lahore, Punjab; Pandit Vindeshwari Prasad Dikshit, Assistant Surgeon in charge of Victoria Hospital, Rewa, Central India.

Rao Sahib

Tattai Narasimha Srinivasan Raghava Acharya, Senior Public Health Assistant, King Institute, Guindy, Madras; Rao Rama Rao, Senior Surgeon, Civil Hospital and

HONOURS GIVEN FOR WORK IN CONNECTION WITH THE QUETTA EARTHQUAKE

His Excellency the Grand Master of the Most Eminent Order of the Indian Empire is pleased to announce that His Imperial Majesty The King, Emperor of India, has been graciously pleased to make

the following appointment to the said Order, for services rendered in connection with the Earthquake in Baluchistan, 1935:—

ORDER OF THE INDIAN EMPIRE

To be a Companion

Lieutenant-Colonel Samuel George Steele Haughton, O.R.E., Indian Medical Service, Officiating Assistant Director of Medical Services, Zhob (Independent) Brigade Areas, Western Command.

ORDER OF THE BRITISH EMPIRE

His Imperial Majesty The King, Emperor of India, has been graciously pleased to give orders for the following appointments to the Most Excellent Order of the British Empire, for services rendered in connection with the Earthquake in Baluchistan, 1935:—

To be Officers

Lieutenant-Colonel Vaman Raghunath Mirajkar, Indian Medical Service, Professor of Operative Surgery, King Edward Medical College, Lahore, Punjab.

Lieutenant-Colonel Jacob William Vanreenen, Indian Medical Service, Officer Commanding, No. 4 Indian Hospital Corps, Quetta.

Kaisar-i-Hind Medal

His Excellency the Viceroy and Governor-General is pleased to announce that His Imperial Majesty The King, Emperor of India, has been graciously pleased to award the Kaisar-i-Hind Medal of the First Class for Public Service in India, for services rendered in connection with the Earthquake in Baluchistan, 1935, to:—

Major James Ernest Gray, Indian Medical Service, Civil Surgeon, Karachi, Bombay.

Captain Bertrand Temple-Raston, Indian Medical Service, Civil Surgeon, Dera Ghazi Khan, Punjab.

INDIAN MEDICAL COUNCIL

BREVET-COLONEL H. H. THORBURN, C.I.E., M.B., CH.B., I.M.S., Officiating Inspector-General, Civil Hospitals and Prisons, N.-W. F. P., has been nominated by the Government of the N.-W. F. P., under clause (a) of sub-section (1) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), as a member of the Medical Council of India, *vice* Dr. Saranjan Khan, resigned.

Current Topics

A New Operation for Hæmorrhoids

By M. SAMY

(From the *Medical Press and Circular*, Vol. CXCI, 21st August, 1935, p. 156)

HÆMORRHOIDS or piles are very common in Egypt, and present all the usual characteristics and complications. People from the Egyptian villages and small towns usually seek the advice of the doctor when it is very necessary to operate on account of repeated hæmorrhages, inflammation, thrombosis or the enormous size of the piles. Before commencing to describe the new operation it is better to mention some few hints about the surgical anatomy of the rectum and anal canal, as this facilitates the understanding of the operation.

Surgical anatomy.—From a surgical standpoint the rectum extends from the pelvi-rectal junction, situated in front of the sacral promontory, to the exit of the anal canal on the surface, between the nates. Its length is about six to eight inches. From the anatomical and developmental point of view this length of the intestinal canal is divided into two separate parts:

(a) *The rectum proper*, which is developed from the hind end of the hindgut and is endo-dermal in origin. It extends from the pelvi-rectal junction to the upper end of the narrow anal canal. The rectum is five to six inches long, and is lined with thick columnar epithelium containing numerous tubular mucous glands. Its mucous membrane is thrown into transverse folds. Usually three of these folds are specially prominent, one on the right and two on the left at a lower and higher level. These form the valves of Houston, and may interfere with the passage of the protoscope.

(b) *The anal canal*, which is developed from the epidermal invagination of the cloaca (proctodæum), and is originally separated from the rectum by a membrane. This membrane disappears about the fourth month of the intra-uterine life. The thin white line of Hilton which is seen in the adult at the ano-rectal junction is the remains of the edges of this membrane. The anal canal is smooth and lined with stratified columnar epithelium. The skin around the anus is thrown up into radiating rugæ.

There is a series of longitudinal processes at the upper end of the anal canal. These are called the

columns of Morgagni. Between these columns we find the pit-like sinuses which are called the valves of Morgagni. These latter may be torn away or lodge foreign bodies, and serve as a starting point for perianal infection.

The peritoneum extends to within 2½ to 3 inches from the anus on the anterior aspect of the bowel. Posteriorly it does not reach lower than about five inches from this point. The muscular wall of the rectum and anus consists of longitudinal and circular fibres homogeneously distributed and fusing just above the ano-rectal junction with the levatores ani and internal sphincter muscles. These, together with the thick ring-like external sphincter ani surrounding the anal canal, establish a certain amount of voluntary control over the evacuation of the lower bowel. The external sphincter and levatores ani are supplied by the pudic nerves, while all the other muscles get their nerve supply from the sympathetic.

The superior hæmorrhoidal artery, a direct downward continuation of the inferior mesenteric artery, supplies the upper part of the rectum and rectal mucosa. The inferior hæmorrhoidal branch of the internal iliac artery supplies the anal canal, lower part of the rectum and ischio-rectal fossæ. Around and in the wall of the lower part of the rectum, free anastomoses occur between the superior and inferior hæmorrhoidal arteries, and to a lesser extent with the middle hæmorrhoidal arteries, which, however, are mainly exhausted in supplying the peri-rectal cellular tissue.

The venous return has a special surgical importance. The superior hæmorrhoidal vein returns the blood from the rectal wall and mucosa, and passes into the valveless portal circulation. The inferior hæmorrhoidal veins drain the anal canal and pass across the ischio-rectal fossæ to the systemic circulation. The tributaries and radicles of these veins inosculate and anastomose freely in the submucous tissue of the lower end of the rectum. The hæmorrhoidal plexus surrounds the rectum and communicates in front with the vesical plexus in the male and the utero vaginal plexus in the female. It consists of two parts, an internal in the submucosa and an external outside muscular coat of the rectum. The internal plexus presents a series of dilated pouches which are arranged in a circle around the gut just above the anus. These pouches are connected by transverse branches and drain mainly into the superior hæmorrhoidal vein.

The inferior hæmorrhoidal vein drains the lower part of the external plexus into the internal pudendal vein, and the middle hæmorrhoidal veins drain the middle part into the hypogastric veins. The upper part is drained by the superior hæmorrhoidal vein which forms the commencement of the inferior mesenteric vein, a tributary of the splenic vein. A free communication occurs between the portal and systemic venous system through the hæmorrhoidal plexus.

So it is evident that any obstruction to the venous outflow of the portal or systemic circulations is reflected to the dependent area in the submucosa of the lower end of the rectum, where the distended veins bulging into the rectal lumen constitute hæmorrhoids or piles. The mucosa covering this area is surgically called the pile-bearing area.

The variety of operations used at present for the radical cure of hæmorrhoids denote that the present operative treatment is incompletely satisfactory up till now. The advantages and disadvantages of these operations are well known. Theoretically, the operations which remove the whole pile-bearing area of the mucous membrane seem to be the best. It is specially useful in old-standing cases of piles with much prolapse and enough laxity of the mucous membrane to ensure that no tension exists on the stitches uniting the skin and the mucosa.

The operations, removing the have been used up till now have some of these disadvantages are: (1) Stricture formation; (2) danger of rectal insecurity; (3) the operation takes a long time; (4) much bleeding occurs during the operation; (5) the wound takes a long time to heal.

The writer has devised an operation which removes the area of the mucosa of the rectum bearing the diseased piles with a little of the normal mucosa above it. The amount of normal mucosa removed depends upon the age of the patient, as will be described below. The above disadvantages are got rid of in this operation. Its additional advantages over modern operations will be mentioned below. I shall now mention a few hints about this operation.

(1) INDICATIONS

This operation is indicated in every case of internal or combined internal and external piles. It is especially indicated in piles that are either long-standing or prolapsed, however slightly. It is also indicated in all the cases that belong to the so-called idiopathic category of piles, but it may be justifiably done in cases of severe piles from cirrhosis. In these cases, the patients should be warned that recurrence is inevitable in a few months. The operation might be injudicious and harmful if cancer is present, or if the piles are caused from enlarged prostate, uterine fibroids or cardiac disease.

(2) PREPARATION OF THE PATIENT

First of all the patient should be medically fit for the operation. Any constitutional fault or disease (e.g., syphilis, etc.) which may exist should be corrected. The teeth should be put in good order and cleansed. An essential point in the preparation of patients for rectal operations is the absolute emptiness of the large bowel, so that no soiling of the wound takes place during the operation if the patient coughs or strains from anaesthesia or other causes. Any proctitis, whether catarrhal, purulent, gonorrhoeal, bilharzial, dysenteric, gummatous or tuberculous, yaws and thread-worms of the rectum, should be thoroughly treated. It is better to take the patient to the hospital at least two days before the operation. The bowels should be freely relieved each of the three days before the operation by aperients given every twenty-four hours. One and a half to two ounces of castor oil may be given every night for this purpose. Any other good and desirable aperient which the patient likes may be advantageously used.

Day before the operation.—If the castor oil or aperient, taken at night, did not act satisfactorily a dose of saline purgative (e.g., magnesium sulphate, magnesia, or sodium sulphate) should be taken early in the morning.

Food.—8 a.m. breakfast, one small piece of bread, butter, jam or honey. 11 a.m., lunch, a cup of milk. 6 p.m., dinner, a cup of soup.

Evening before the operation.—A high soap-and-water enema is made with the aid of a long catheter. This enema is repeated if necessary until it comes back clear. Then the following draught is taken:

R Tincture opium	..	..	℥ x
Solution of ammonium acetate	..	..	℥ xxx
Spirit of chloroform	..	..	℥ xv
Tincture of catechu	..	..	℥ ½
Compound tincture of cardamom	..	..	℥ ½
Cinnamon water	..	..	℥ i

This opium draught is useful in many ways. It induces a good sleep at night and prevents soiling of the area of the operation by inhibiting peristalsis. So when the enema of the next morning is given the lower bowels are emptied without causing peristalsis or bringing fresh material from above into the field of the operation. The next step is to shave the area of the operation and a sufficient area surrounding it. It is better to use a good quality powder (sulphide) for the removal of the hair, to avoid scratches and superficial wounds made by the razor in shaving. The amount of the powder used should be just sufficient to remove the hair, because much powder also dissolves some of the horny layers of the skin. Shaving or the use of a reasonable amount of hair-removing powder is efficient in removing the sodden epithelium and its contained bacteria.

The patient should then take a good hot bath and should thoroughly cleanse the skin of his body, especially the skin of the perineum.

Morning of the operation.—Four hours before the operation a plain tepid water enema (1½ pints) is made. This is repeated if not returned clear. After that the patient is instructed to void urine and also to get the bowels fully relieved. Now the anus, anal canal and lower part of the rectum are washed out with 2½ per cent carbolic acid solution by means of a two-way tube. The skin from the waist to the middle of the thighs is now prepared in the same way as for the cleanest laparotomy.

It is prepared in the following order: (1) Wash the parts with soap for five minutes. No undue scrubbing or rubbing should be done, because they may wake up into activity germs lying dormant in the deeper parts of the skin. (2) Cleanse with ether by firmly rubbing the skin with a swab soaked in ether. This dissolves and removes fat and sebaceous matter and sterilizes the layers of the skin to a great depth. (3) Cleanse with 0.2 per cent biniodide of mercury in alcohol. This solution is a very powerful germicide, efficient antiseptic, and does not react much with albumin. (4) Paint the parts with 1/1,000 aqueous solution of biniodide, which is more efficient in penetrating the tissues than the alcoholic solution. The formula of this solution is as follows:

R Biniodide of mercury	..	..	1.0
Potassium iodide	..	..	1.0
Sterilized water	..	..	1,000.0

(5) Thoroughly cleanse with pure benzene. (6) Paint with ether again. (7) Leave place to dry and then paint twice with 2.5 per cent iodine in 70 per cent rectified spirit. The place should be dry before painting; because alcoholic antiseptic solution acts properly when applied to a dry surface, as moisture causes the cells of the prickly-celled layer of the skin to swell and hinders the action. The iodine tincture, in addition to its sterilizing properties, stains the skin, rendering apparent at once any unsterilized area exposed, should the towels require rearrangement. (8) The anus, anal

canal and lower part of the rectum are painted with 2.5 per cent iodine tincture by means of sponges and sponge forceps. (9) The perineum is then rubbed with 70 per cent alcohol for five minutes. (10) The area is then covered with a sterilized towel. (11) A hot water bag is placed over the towel for the fifteen minutes just before the operation.

Forty-five minutes before the operation 0.01 of a gramme morphine hydrochloride, 1/200 of a grain hyoscine (scopolamine) hydrochloride and one ampoule of coaguline ciba are injected separately under the skin. The morphia corroborates the action of the previous dose of opium in inhibiting peristalsis. Also, together with the hyoscine hydrochloride, it produces a kind of twilight sleep and helps the anaesthesia much. The coaguline increases the coagulability of the blood and thus lessens bleeding during the operation. The patient usually sleeps after the operation, and this is very useful in every way. The patient awakes from his sleep after the pain of the operation (if any exists) is completely or mostly gone.

The above method of preparation is most suitable and ideal, but minor modifications may be made in it to suit hospital cases, children, old people, and people with special constitutional diseases.

(3) ANAESTHESIA

The patient should be placed comfortably upon the operating table and the operation should be completed as much as possible without his knowledge. He should be made to believe that he is still being prepared. The proper anaesthetic suitable for each case should be chosen by the anaesthetist. Most of my cases did very well with sacral, regional and local anaesthesia. If general anaesthesia is given the patient should be warmly wrapped with blankets and anaesthetized outside the actual operating theatre. In the theatre the blankets are removed and substituted with warm bath towelling to maintain the body warmth. The writer employs the following method of anaesthesia with very satisfactory results:

The instruments used are: (1) A syringe, 20 c.c. capacity, with a glass or metal plunger. The barrel must be fitted with rings or some other form of finger grip to enable the operator to get sufficient and steady pressure on the plunger. (2) A syringe, 10 c.c. capacity, and of the same kind as the above one. (3) Six hypodermic needles. These should be fine, sharp, smooth, bevelled and accurately fitting to the syringe, so that the joint is absolutely air-tight; two of the needles should be about 7 cm. long, two of usual length, 4 cm., and the remaining two each 15 cm. long. The syringe and needles should be sterilized in plain water, which should not contain any trace of sodium carbonate or bicarbonate, because these salts decompose the novocaine solutions which are used in this method.

Some 2 per cent solution is put in a glass flask with a cotton-wool cork and sterilized for fifteen minutes. Then 1.5 c.c., or 25 drops, of sterilized adrenaline hydrochloride, 1/1,000 solution, is aseptically added to it just before use. The adrenaline constricts the blood vessels, and this lessens the absorption of novocaine, localizes its action, prolongs its period of activity and minimizes bleeding during operation.

Anaesthesia.—The patient is placed in the left semi-prone position with the knees well drawn up. The sacral hiatus is felt just above the sacro-coccygeal joint. Two little spinous processes guide its entrance, and the opening is just below and between them. The skin at this spot is anaesthetized by a small hypodermic needle and an ordinary syringe containing $\frac{1}{2}$ c.c. of the 2 per cent solution of novocaine mentioned above. Now a 7 c.c. needle is pushed gently through the hiatus, and will be felt to puncture the membrane. Then the butt of the needle is pushed downwards towards the perineum and the needle passed backwards almost parallel with the posterior surface of the sacrum. It should pass a distance of 1½ to 2 inches. If cerebro-spinal fluid flows out the needle should be withdrawn. If blood

comes out of the needle (due to vein puncture, etc.), the position of the needle is changed until no blood comes out of it. Then 20 c.c. of the above 2 per cent solution of novocaine is injected. The syringe and needle are then withdrawn and a small piece of dressing soaked with collodion is placed over the site of the prick of the needle. Then the following solution is prepared and sterilized by the same method as the above 2 per cent novocaine solution, and used after the addition of 1.5 c.c. of sterile 1/1,000 adrenaline hydrochloride solution:

R Novocaine (tablets or powder)	..	1.00
Calcium chloride	..	0.25
Sterilized normal saline solution	..	100.00

15 c.c. of this solution is taken in the syringe.

A medium needle (7 cm. long) is inserted half an inch to one side of the middle line opposite the tip of the coccyx for the depth of about one inch. One and a half c.c. of the solution is then injected. A similar injection is made on the opposite side. Again the medium needle is inserted just to one side of the coccyx and passed up to the hollow of the sacrum, guided by a finger in the rectum. One c.c. is injected in this area around the nerves emerging from the last two sacral foramina. This is done on both sides. One cubic centimetre of the solution is then injected in each ischio-rectal fossa. One c.c. is also injected in each side of the middle line in front of the rectum, and between it and the vagina or prostate, and around the anus. The injection is continued as the needle is advanced.

Now the long needle (15 cm. long), guided by a finger in the rectum, is passed in from a point just outside the anus towards the spine of the ischium. When this latter is felt it is then directed backwards until the outer side of this bone is reached; 2 c.c. are injected at this spot. A similar injection is made on the opposite side. By the above method we safely get excellent anaesthesia of the rectum and perineum after about twenty minutes. After this time the patient's skin should be tested by a pin before beginning the actual operation. This anaesthesia keeps for about an hour.

The patient is placed in the lithotomy position, Clover's crutch being used for this purpose, the buttocks made to project slightly over the end of the operating table and the pelvis is slightly raised. In this position the legs should be near the middle line and the leggings so arranged as to produce no undue opening of the buttocks from each other and thus produce tension on the stitches during the operation. No undue or prolonged pressure should be put on the external popliteal nerves. This is likely to happen in a patient with long thin legs, and may cause temporary paralysis of the peronei muscles. The hands and legs of the patient are gently and securely tied to the operating table. The surgeon sits opposite the perineum and the assistant stands on his right.

The anus and an area one inch in diameter of the skin around it are completely isolated by means of towels and towel clips. The scrotum and penis should be thoroughly retracted above.

Before starting the operation the rectum should be digitally examined to ascertain the position of the piles. The anal canal is then painted with 2.5 per cent tincture of iodine by means of a sponge and forceps, and then the skin of the area around the anus is painted with 5 per cent iodine tincture in 70 per cent alcohol by means of another sponge and forceps. Both forceps are thrown away and should not be used again during the operation.

Now one finger is inserted in the anus and the piles can be coaxed outside. Very rarely this manoeuvre fails to show the piles. If this happens, the anus is very gently dilated to cause temporary paralysis of the sphincters. This is done by putting the index fingers of both hands one after the other through the anal aperture and exerting gentle, continuous and firm traction until the sphincters are felt to relax or give way. When this begins to happen, the pressure from within

is very gradually diminished to avoid overstretching, laceration and tearing of the muscles. It takes about two minutes to produce sufficient dilatation. As full dilatation or stretching of the sphincters and cause much pain after the operation and may produce retention of urine, so it must be avoided as much as possible. The hæmorrhoids now prolapse and come completely into view. With a sponge and forceps the anus, anal canal and rectum are again painted as high as possible with 2.5 per cent tincture of iodine in 70 per cent alcohol. A sterilized bandage 5 cm. in breadth and about 50 cm. long is then used to plug and not to pack the rectum so as to separate it from the field of the operation. The end of this plug is caught by means of a suture of catgut no. 3 about 30 cm. long. The suture is doubled, and its two ends are held by an artery forceps and left to hang down.

Now three lines are chosen in the circle of the anus, in which lines there are very small piles or no piles at all. These lines should be about $\frac{1}{2}$ to $\frac{2}{3}$ of a centimetre in length, and the distances between them should be about equal.

The tissues lying under these lines are left untouched. Tissues, prolapsed piles, mucous membrane and muco-cutaneous junction lying in between the chosen lines are now grasped by three separate pile forceps. Each forceps is made to grasp the whole tissue tightly and firmly. The forceps are applied longitudinally on the bowel, i.e., along the pile, and are left in position as a guide to the site of the pile until the surgeon finds it convenient to deal with them. These forceps hang loose, and are not in the way.

Now one of the forceps, preferably the posterior one, is held in the left hand and drawn anteriorly. If one commences with one of the anterior forceps, the posterior piles may be obscured by the blood, and the smaller piles, which are evident enough before the actual operation is commenced, may be lost sight of after some of the main anterior piles have been dealt with. A very sharp suitable knife is held in the right hand, and a clean cut is made in the skin just lateral (about 1 cm. lateral) to the muco-cutaneous junction, and in the muco-cutaneous junction.

The incision should be lateral to external piles, tags or irregularities of the skin which may exist. By clean dissection the diseased hæmorrhoidal area of the mucous membrane of the grasped portion is separated from the submucous tissue which lies between it and the subjacent muscles. The separation should be as high as possible with thorough undermining of the mucous membrane. The piles and mucous membrane are pulled down below the level of the anus, and then left to rest down without traction. Now the incised skin is thoroughly undermined.

Three or four interrupted twenty-days catgut no. 2 sutures are made between the deeper parts of the undermined skin and the highest line of the undermined mucous membrane above the diseased piles. If the patient is below forty years of age the dissection, undermining and suturing of the mucous membrane should be a little higher than if he is more than forty years old. This is because under the age of forty years some of the piles are immature and hidden, while at the age of forty years or more usually all the piles are mature and apparent. There should be no tension at all on the stitches. These sutures prevent the formation of a hæmatoma and subsequent stretching of the scar. They should take large bites of the deeper tissues, including the deep layers of the skin, sphincter, muscular and submucous walls of the bowel. Now the diseased hæmorrhoidal portion of that part of the mucous membrane is cut away with sharp scissors. This portion never extends beyond two inches from the anus. The cut wants careful judgment, and should be made just below the above sutures. If one leaves too much, the anus becomes surrounded by a crop of outstanding fibrous folds, which may become inflamed and need to be snipped away on a later occasion. Too great a removal may result in inversion of the skin; bleeding points should be immediately held with forceps, and

then underpinned by sutures. The free margin of the skin and cut edge of the mucous membrane are then stitched together by the insertion of a number of interrupted ten-days catgut no. 2 sutures. The sutures should advisably pick up the edge of the sphincter as they are passed. The deep stitches should be done with fine intestinal, round-bodied suture needles, and the superficial stitches with sharp, medium-sized, fully-curved and round-bodied needles. Before closing the wound the tissues should be washed with 2.5 per cent carbolic acid solution and painted with 2.5 per cent iodine tincture. Very great care should be taken to fit and coapt cut margins of the skin and mucous membrane truly and exactly together. The needle is passed through the mucous membrane in such a way as to take up any oozing vessel with it. There should be no eversion of the mucous membrane nor inversion of the skin, nor overlapping nor rolling of the edges of the wound, as these conditions especially the first cause much trouble to the patient afterwards and make him believe that the piles have recurred. Absolute hæmostasis should be ensured. All dead spaces in which blood clots or effusions may collect should be obliterated to avoid septic trouble at a later period.

The sutures should not be tied too tightly otherwise they would strangulate the tissues in their grasp, and by auto-infection of the strangulated tissues, stitch suppuration happens. Very tight stitches may also cut out and produce unnecessary scarring. So each suture should be tied only tight enough to keep the margins of the wound in exact apposition. The sutures should not be directly employed after being taken from spirit, which acts thereby as a caustic. So all suture material should be carefully washed with salt solution before use, if stitch abscess is to be avoided. The same thing is done with the tissues held by the other two forceps or volsellæ, and the plug is then gently and neatly removed.

The area of the operation is thoroughly washed with 2.5 per cent carbolic, painted with 2.5 per cent iodine, and then washed with sterilized saline. Small pieces of glove rubber are put in between the stitches. These allow drainage of any exudate which might happen to form and should be removed after forty-eight hours. A strong stainless safety pin is inserted in the middle of a 20 cm. long drainage tube. The diameter of this tube should be about $\frac{1}{4}$ cm. The tube is wrapped round with gauze, and one end of it is pushed into the anal aperture until the pin comes into contact with the anus. The tube comforts the patient much by allowing the passage of flatus. It also prevents or minimizes bleeding and contamination of the margins of the wound. The pin should be made to touch the anus sagittally and not transversely.

Dressings are applied to the wound, and a thick (1 cm.) ring of sponges is put between the anus and the pin. Thick dressings and cotton are placed over the area of the operation. These dressings should have a hole in their centre to allow the passage of the tube. A bandage with a hole in its middle for the tube is then applied.

All bleeding and oozing should be absolutely stopped before the wound is covered. No skin of the anal margin should be included in any ligature or crushed, otherwise much pain will be induced, and it is possible that a stricture of the anus may afterwards develop. No raw area should be left uncovered by skin, and strict asepsis should be observed. One should take his time in doing this operation accurately, as nothing is gained by undue and showy rapidity. If piles only exist in one or two places in the circle of the anus and the rest of the anus is found to be absolutely free from hæmorrhoids, dissection, undermining, suturing and excision is done in the diseased places only.

AFTER-TREATMENT

The best bed for a patient who has been operated upon by this method is a narrow, fairly high bed, with either a very stiff spring mattress or boards. Another

mattress may be used if necessary. The hygienic condition of the surroundings should be looked after. The legs of the patient should be put together, and he should be moved by the draw sheet and not by holding him, to avoid displacement of the dressing and hurting the patient.

The legs should be kept as near as possible to each other until the wound heals. If the patient has had a general anæsthetic, he should be covered up warmly and conveyed to a warm bed. He should be protected from draughts by covering the head during transit from the theatre to the bedroom to lessen the chances of post-anæsthetic pulmonary troubles.

The after-treatment wants very skilful and conscientious nursing. The air should be allowed to circulate freely in the neighbourhood of the dressing so as to prevent the dressing from becoming moist. The wound should be kept clean and dry the first seven days. Any oozing or discharge should be washed or swabbed off with hydrogen peroxide solution, as it may undergo decomposition and sepsis may result. This hydrogen peroxide solution is somewhat styptic, and cleanses the area by its mechanical action when bubbling off nascent oxygen. The part should be dressed for the first time twenty-four hours after the operation. The wound is gently cleansed with pure ether and painted with 2.5 per cent. iodine in 7 per cent rectified spirit, and a dry dressing applied. After another twenty-four hours the glove rubber pieces are removed and the same cleansing, painting and dressing done. The glove rubber pieces should not be removed before forty-eight hours after the operation, as imperfect drainage leading to tension on the stitches prevent healing by first intention. The wound is dressed in the same way every twenty-four hours until the morning of the eighth day, when the interrupted stitches are removed. By this time the wound would have usually healed aseptically. The time taken by an aseptic wound to heal properly depends upon the age and vigour of the individual and the degree of tension required to close the wound. Discharging wounds may require several dressings in the twenty-four hours. These dressings of the wound should be conducted with the same precautions as to the aseptis of the hands, instruments, etc., as the original operation because many instances of wound infection occur from the after-dressings.

Also it is essential that everything likely to be required should be prepared before the dressings are removed, so that exposure of the wound to air may last as short a time as possible.

If general anæsthesia has been given, no diet should be given to the patient before its direct after-effects have passed away and the patient has become completely conscious. After this the patient is only allowed a pint of plain water in the first sixteen hours after the operation. Coffee and tea are also allowed. If, on the other hand, local anæsthesia has been used, the patient, if he wants to, may begin to drink water directly after the operation but he also is allowed only a pint of plain water, coffee and tea in the first sixteen hours after operation.

If any pain is felt, 10 to 15 grains of meta-aspirin may be given at night. On very rare occasions one is obliged to use trional or even morphia if the pain is severe. Rising temperature and pain suggest suppuration, and usually manifest on the third or fourth day after the operation. This may be delayed as late as the tenth day in case of deep suppuration.

If any retention of urine occurs the patient may be left twelve to fourteen hours without passing a catheter. The conditions being unusual, the patient may be unable to urinate; accordingly it is advisable to allow him to stand by the bed alone in the room. The patient should do no straining, as it does not help him, and only causes pain in the rectum. If retention is still present, a catheter is passed under very strict aseptic conditions. Putting a hot water bag over the hypogastric region directly after the operation is very useful in preventing the occurrence of retention of urine.

The water of the bag should be changed when it loses its heat. One should continue using the hot-water bag until one is sure that the urine is passing normally.

As soon as possible after the operation one drachm of liquor opii sedativus (B. P. C.) should be given. It has enjoyed a reputation for a long time as an anodyne and sedative superior to tincture of opium. Then one ounce of the following mixture is taken every four hours for the first sixteen hours, and every eight hours in the succeeding forty-eight hours, and twice daily (morning and evening) up till the evening of the seventh day after the operation:

R. Liquor ammonium acetate	..	5 $\frac{1}{2}$
Tincture of catechu	..	5 $\frac{1}{2}$
Tincture of opium	..	m x
Compound tincture of cardamoms	..	m x
Distilled water ad	..	℥ 1
Twenty-one doses.		

This keeps the patient constipated until the morning of the eighth day after the operation, when the superficial stitches are removed. The patient, fearing pain, naturally resists any inclination to defæcate, and the desire soon passes away. The tube is removed in the morning of the fifth day after the operation, unless the patient is very uncomfortable from it, or there is much fæces coming down. Under such circumstances the tube is removed earlier than the fifth day, to be reapplied if the patient gets flatulence.

Some twenty-four hours after the operation the patient is allowed drinks, e.g., lemonade, orange water, barley water, caraway water, tea, coffee and beef tea. These drinks are given for seventy-two hours, and no aperient drinks, e.g., tamarindus infusion, etc., should be allowed. Then he is allowed to take bread, butter, jam, boiled potatoes (with some butter, lemon and salt), rice, macaroni, water melon, cooked apples, and similar mild foods in small amounts. Milk should not be given, nor any kind of food which produces much gas (e.g., most of the vegetables), nor foods which have any laxative action. The food should be sufficiently nourishing, but not bulky nor heavy. Variations in quantity and quality of the food should be made according to the patient and the circumstances.

On the morning of the eighth day the patient is given one and a half ounces of castor oil, and after one and a half hours an enema of three to four ounces of olive oil. The patient may defæcate in a bed pan or in a commode by the side of the bed. He should not strain at stool. The bowels are kept open daily, and for a week the stools should be quite fluid. A tablespoonful of petroleum taken twice daily with a mild aperient taken overnight will generally ensure daily a perfect watery action of the bowels. This is essential for a satisfactory cure and the comfort of the patient. The patient may use any good aperient which he likes.

The patient can leave the hospital or nursing home in the afternoon of the eighth day, and should wash the anus and perineum with warm 2.5 per cent carbolic solution after each action of the bowels. He can use senna pods or cascara evacuant, which are excellent aperients. He can eat satisfactory quantities of all kinds of food except the very irritant.

The advantages of this operation over other operations previously used for the radical cure of hæmorrhoids are:

(1) The skin incision includes not only the piles, but also the folds of the skin lateral to them and tags of hypertrophied tissue at the muco-cutaneous junction. In the other operations these folds and tags are not removed, and may require another operation for their removal.

(2) The section of the skin lays open the superficial veins of the inferior hæmorrhoidal plexus, and the œdema which used to happen after some pole operations is either entirely absent or minimized to a great extent.

(3) The hæmorrhoids are not likely to recur when the ligature and excision operation is done properly in

a patient above forty years of age, and the piles present are completely removed. On the other hand, if the patient is under forty years of age at the time of the operation, all the piles may not have developed or matured, so that later in life a second operation may be required for the removal of the piles that have matured. But if the above operation is performed properly in a patient under forty years of age, there is no recurrence.

(4) There is no danger of stricture formation after the above operation, because the three lines of tissues left unincised in the circle of the anus act as elastic bands and prevent stricture formation.

(5) The period of convalescence is very short.

(6) The pain after the operation is either completely absent or minimized to a great extent. This is because of the clean cutting, non-bruising and non-tearing of the tissues during the operation. Also very strict aseptic and antiseptic conditions count much in the prevention of the after-pain of the operation.

(7) Rectal insecurity does not occur because parts of the sensitive mucous membrane which line the anal canal are left unexcised during the operation. The sphincters also are uninjured during the operation. Rectal insecurity usually occurs, at least for some time after operations that totally remove the mucous membrane lining the anal canal.

(8) Primary union usually takes place. The anus, anal canal and rectum are unclean parts of the body, but should not be counted as septic, because they do not contain septic micro-organisms in large quantities. No part of the skin or mucous membrane, as far as we know, is free from pathogenic micro-organisms. Probably the largest number of micro-organisms to a given surface is found in the mouth. The faeces as a matter of fact do not, under ordinary circumstances, contain an exceptional number of pathogenic organisms. With the exception of the *Bacillus coli*, few are pathogenic. So the mucous membrane of the rectum might be favourably compared as regards the number and quality of micro-organisms upon its surface with the skin on the exposed portions of the body, and exceptionally favourable with mucous membrane of the mouth. Accordingly the rectum is not septic, but simply difficult to make clean by the ordinary methods used with other parts of the body.

So, as specified above, it should have specially modified methods in the preparation and after-treatment. When these methods are performed properly we usually get healing by first intention. Healing of the wound commences immediately after the operation and is more rapid the closer the tissues are approximated, as there is less blood clot to be disintegrated and absorbed. Healing of wounds is really a process of inflammation: the blood clot is invaded by capillary loops, which revascularize the area, and then in their turn become obliterated by pressure of the newly-formed fibrous tissue.

Healing is almost identical to resolution. If the tissues are approximated and no injection occurs, healing takes place by first intention, and should be sufficiently progressed in ten days to allow the tissues remaining in apposition without support under normal conditions. A thin layer of blood clot lies between the surface of the wound and penetrates into their irregularities, and the contraction of this clot is at first the chief means of keeping the deeper parts in apposition. There is but a microscopic line of damaged tissue, which together with the blood clot is easily absorbed. A thin layer of granulations develops on either side, and these unite across the wound in a few days, and are transformed into granulation tissue.

Should the tissues not be approximated, or infection occurs, then healing will be by granulation, and takes a much longer time. The larger the wound the longer being the time taken, as the granulations arising from the surface have to grow up and fill the gap. In case of delayed union, ultra-violet rays may be used in order to increase the blood supply to the area of the wound. But the four causes of delayed union (sepsis, syphilis,

foreign bodies and undue movement) are mostly preventable.

Fractures of the Neck of the Femur

By S. A. S. MALKIN, M.B., B.S., F.R.C.S.

(From the *Medical Press and Circular*, Vol. CXCI, 23rd October, 1935, p. 363).

PROBABLY no fractures have in the past given rise to more anxiety or have been more uncertain as to their end results than fractures of the neck of the femur, for they are fractures in which non-union frequently occurs. Many reasons have been given for this: (1) The fracture occurs chiefly in the elderly; (2) it is often at first unrecognized; (3) the head of the femur has a poor blood supply; (4) the fractured surfaces are bathed by synovial fluid. It is now, however, widely held that while these may be predisposing causes, the real reason for non-union is the lack of adequate apposition of the fractured ends of bone and the lack of adequate fixation for a long enough period.

Types of fractures.—Fractures of the neck of the femur have been classified in several ways, but for practical purposes they can be divided into two groups: (1) sub-capital fractures, i.e., intracapsular fractures; (2) basal fractures, i.e., fractures through the base of the neck which may be partly intra- and partly extracapsular. Either type may be impacted, and in cases of impaction, or partial impaction, the fact that a fracture has taken place may not at first be recognized either by the medical attendant or by the patient, who may be able to walk. An impaction may be simulated by a partial locking of the fractured fragments, in which case it is certain ultimately to give way.

The sub-capital type is the more difficult to treat, and the one more likely to result in non-union if the treatment is inadequate.

Displacement.—In considering the treatment of the condition, the first essential is to visualize the displacement. In the typical case, that without impaction, the limb is shortened, adducted and externally rotated. Shortening may be caused partly by the injury itself, or may be produced and maintained by the pull of the gluteal muscles attached to the great trochanter, and of the muscles of the thigh. Adduction is caused by the adductor muscles, which have to act without their normal fulcrum, and which, in an attempt to support and fix the limb, pull the shaft of the femur inwards. External rotation is caused by the weight of the limb, which naturally falls outwards when the patient is lying. If impaction or partial impaction or locking of the fragments has occurred, the displacement will naturally be modified accordingly. The position would be shown by an x-ray photograph, and if possible a lateral view should be taken. For this purpose a curved cassette may with advantage be used.

Treatment.—The first object of treatment is to correct the shortening and to restore the normal alignment. As the displacement is one of adduction and external rotation, it follows that treatment must aim at reversing this process, and after overcoming the shortening by traction must abduct and internally rotate the limb. All authorities are agreed about this, but it is on the methods both of reduction and of fixation that divergencies of opinion occur. It was Royal Whitman who first recognized the fact that success in the treatment of this fracture, as of all fractures, depends primarily on obtaining a correct alignment of the fragments and adequate fixation. Two methods of attaining this object will be mentioned.

METHODS OF TREATMENT

(1) The abduction and plaster fixation method of Whitman. (2) Open operation.

(1) *Whitman's method.*—Whitman observed that if, under anaesthesia, the upward displacement of the shaft were reduced by direct manual traction on the limb, slight inward rotation and abduction of the limb to

the normal limit would place both fragments in the same plane. At the same time the tension of the capsule incidental to abduction would oppose and force the fragments into direct and resistant contact, which in fractures of the intracapsular type is essential for repair. He considered that the security assured by bony contact and capsular tension would be still further supplemented by the contact of the trochanter with the side of the pelvis; in sub-capital fractures, by inclusion of the fracture line within the acetabulum, and finally by relaxation of the muscles. He contends that in this way the natural mechanics of the joint are used both to fix the fragments and to correct the deformity.

In detail, the method is as follows:—Where a special table is not available, the patient, having been anaesthetized, is placed on a pelvic support, his shoulders raised on a box of equal height. Two assistants make manual traction on the extended limbs, drawing the perineum firmly against the bar of the pelvic support on the injured side. The surgeon meanwhile lifts the thigh upward if it is below the plane of its fellow. Both limbs now being extended and under manual traction, that on the injured side is slightly rotated inwards, and they are then abducted to the full extent, the sound side first, in order to demonstrate the normal range and to balance the pelvis. Measurements are made to ensure that the shortening has been corrected, and if possible x-rays, antero-posterior and lateral views, are taken to confirm the position. Plaster of Paris is then applied, including the foot, with the limb in

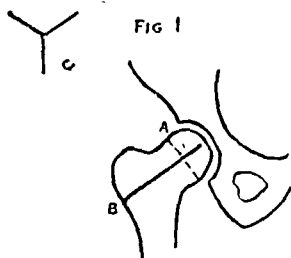


Fig. 1.—(a) Line of fracture; (b) Smith Petersen pin *in situ*; (c) cross section of pin.

complete abduction, full extension and slight inward rotation. When the spica is firm, the patient is placed in bed, the head of which is raised one or two feet. As soon as possible he is turned completely on to his face, and this is repeated from time to time in order to avoid the possibility of bed sores. This spica is retained for probably about six months, *i.e.*, until it can be demonstrated by x-ray that union is firm. Full weight-bearing is not permitted until free painless movements indicate stability and repair. When the plaster is removed the patient should remain in bed for a few weeks for muscular re-education. It is of vital importance that premature weight-bearing should not be allowed, as this will prevent union and cause a deformity.

A method for attaining and holding the position of abduction and internal rotation as advocated by Whitman, without the use of a plaster spica, has been devised by Roger Anderson. He applies a plaster case to the affected leg below the knee, and to the sound leg as far as the middle of the thigh. A special apparatus is attached to each plaster, and by the use of skeletal traction the correct position is attained, the sound leg being used for counter traction.

(2) *Open operation.*—In order to reduce the length of recumbency necessary and to make more certain of good apposition and union, some surgeons advocate open operative fixation of the fracture. For many years bone grafts and pegs have been used in the exceptional case. Smith Petersen, however, has evolved a method in which he uses a special steel pin which in his opinion should be the routine way of treating all fractures of the neck of the femur. The

principle is to correct the deformity of the bone by manipulation and traction and to expose the fragments

Fig 2



Fig. 2.—Old-ununited fracture.

so that they can be seen clearly. The special steel pin is then inserted through the great trochanter along the neck and into the head of the bone (figure 1). Wires are sometimes used first to act as directors, and their position checked by x-ray. After this operation some patients commence walking as early as fourteen days, though many advocates of the method think it is inadvisable to allow weight-bearing until consolidation of the bone has taken place. The great advantage of the operation is that no other fixation is necessary, plaster of Paris is dispensed with, and free movements

Fig 3.



Fig. 3.—Old-ununited fracture after Lorenz bifurcation operation.

of the hip and knee are possible from the first. The method is sometimes used in the earlier cases of non-union. It is then necessary first to freshen the fractured ends of bone.

OLD CASES

It is likely, however much the methods of treatment may be improved in the future, that there will from time to time be some cases of non-union (figure 2). Patients who have this distressing condition complain of constant pain and weakness of the leg, and have the deformities of adduction and external rotation with shortening of the limb. Their treatment presents a real problem. Some surgeons expose the fractured ends of bone, freshen them and insert a bone peg through the trochanter. Whitman removes the femoral head, and detaching the great trochanter, re-attaches it lower down on the shaft of the femur in such a way as to enable the neck of the bone to take up a position in the acetabulum. The hip is then fixed in a plaster spica.

Of all operations, the simplest, and one which merits very careful consideration, is an osteotomy of the femur. The osteotomy may be of two types:

(1) Lorenz's bifurcation operation (figure 3).—The shaft of the femur is divided below the small trochanter, and is displaced inwards so as to lie against the pelvis at the lower border of the acetabulum. The limb is fixed in moderate abduction in plaster, and when united, this ensures that the weight is partly taken off the site of fracture and transferred to the pelvis directly. It also prevents the shearing effect which carrying the body-weight on the affected limb causes in the presence of non-union, and it may result in union of the fracture.

(2) Pertrochanteric osteotomy (figure 4).—The object of this operation is to form a buttress for the fracture. The femur is divided just above the small trochanter, and the shaft is displaced inwards so that the

FIG. 4.

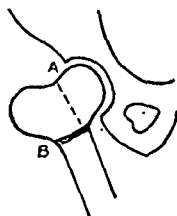


Fig. 4.—Old-ununited fracture after pertrochanteric osteotomy with displacement of shaft inward to support line of fracture. (a) Line of fracture; (b) position of osteotomy.

upper end lies below the line of fracture. The leg is fixed in plaster in abduction for about four months, until union of the osteotomy is sound. Like the Lorenz operation, it stabilizes the hip-joint by preventing the weight of the body from being borne by the fractured surfaces. It may result in union of the fracture.

COMMENTARY

In the treatment of fractures of the neck of the femur the choice lies between the abduction and plaster method of Whitman and the open operation. The Whitman method still holds the field as that of widest application. Careful attention to detail and the use of lateral x-rays should increase the percentage of good results. Smith Petersen's method is still on trial, and its use will always be limited to those surgeons who specialize in this type of work.

In the old case of non-union the simplest way of relieving symptoms is to perform an osteotomy either of the Lorenz or pertrochanteric type, though the reconstruction methods of Whitman and others all have their special applications.

The Anæmias of Nutritional Deficiency, Ætiology, Diagnosis, Treatment and Prevention

By G. R. MINOT, M.D.

(From the *Journal of the American Medical Association*, Vol. CV, 12th October, 1935, p. 1176)

THE development of information concerning anæmia during the past decade has permitted the clear recognition that this condition often may be dependent on defective or deficient nutrition. This idea, however, is not new; for example, in 1651 was written by an anonymous author '[Chlorosis is] chiefly found in young maidens who.....foolishly feed upon trash'. Wide gaps in our knowledge remain and complete information concerning the mechanism of producing anæmia associated with nutritional deficiency must be obtained in the future, but at present one can recognize that anæmias may arise because of a lack or non-availability in the body of at least three classes of dietary substances: (1) iron, (2) vitamin C and (3) a mysterious substance contained abundantly in liver and, to a less extent, in certain other organs which, if absent, makes normal blood formation impossible, and anæmias of the so-called pernicious type ensue.

ÆTIOLOGY

The anæmias due to a deficiency of the material effective in pernicious anæmia are macrocytic, but all cases of anæmia with the red blood cells averaging larger than normal are apparently not due to a shortage

of this material. The effective substance or substances are perhaps becoming less mysterious as the result of the work of West and Dakin and of Jacobson, Subba Row and Fiske and appear to bear some sort of relation to the vitamin B complex. A deficiency of the material effective in pernicious anæmia may be brought about in several ways and undoubtedly more than one mechanism is operative in many cases. It is to be noted that the normal individual, as Castle has shown, obtains the material from a variety of dietary sources because by means of gastric digestion he can derive it from certain precursors which the food contains. Muscle meat, eggs, rice polishings and yeast contain the dietary factor, which is thus associated with a number of sources of the vitamin B complex but is not identifiable with any of the known portions of this complex. The exact nature of the gastric digestive factor is unknown, but it is not one of the well recognized gastric secretory components. It is probable that the gastric reaction proceeds somewhat according to the law of mass action, so that a little of the gastric factor in the presence of a large amount of the food factor, and *vice versa*, may produce material sufficient to meet to a significant degree the demands of the body. A lack of the digestive power will result in shortage of the necessary substance, which is what happens in virtually all cases of Addisonian pernicious anæmia. The same state of affairs may occur from total ablation of the stomach or its destruction from cancer, and sometimes in pregnancy. If there is little food containing the precursors there is also a deficit of the substance, as may arise in tropical macrocytic anæmias, including sprue, in pregnancy and perhaps in certain cases of pellagra. Faulty absorption of the formed material also can create a deficit of it in the body, as takes place in certain cases of coeliac disease, advanced sprue and rare instances of intestinal stenosis and multiple anastomosis, and a deficit may also result from prolonged diarrhoea. In liver, kidney and certain other organs the potent material exists preformed, and that is why these organs, in contrast to beefsteak, for example, are effective in pernicious anæmia.

Defect of the internal or intermediary metabolism of the effective material may perhaps play a rôle in the production of some cases of macrocytic anæmia. There is no real proof of this disorder, but the variation in the injected dose of the same liver extract required for the maximal effects in apparently similar cases suggests, among other reasons, the existence of such a condition. This mechanism has been speculated on to explain, for example, the macrocytic anæmia associated with liver cirrhosis, a condition which may occur in a patient with pernicious anæmia. Wilkinson has called certain cases of anæmia with megalocytosis not responding to liver extract 'achrestic anæmia (from $\chi\rho\eta\sigma\theta\alpha\iota$, to utilize)'. However, because an anæmia does not respond to liver it does not imply that there is inability to utilize or mobilize the material needed by the pernicious anæmia patient. Such a condition may exist, but by similar reasoning one would surely not deduce that because cases presenting purpura did not respond to orange juice they were cases of scurvy failing to utilize vitamin C.

Deficiency of vitamin C (cevitamic acid) leads often to anæmia of a normocytic or slightly macrocytic type. This anæmia, when uncomplicated, responds to this substance and not to liver extract or iron.

The 'iron' deficiency anæmia or anæmias that at present may be thought of as representing this condition are hypochromic and usually microcytic. Hæmoglobin deficiency is the feature, and this may arise from lack of material other than iron needed to build the hæmoglobin molecule, so that all or some of the conditions referred to for clarity as 'iron' deficiency anæmia may be primarily dependent on some more subtle or extensive defect. They can, however, be cured or permanently arrested by iron therapy.

These anæmias can arise because of an inadequate diet or faulty absorption of iron. The latter condition

may depend on various factors altering the motility and secretions of the gastro-intestinal tract and the composition of its contents. Improper mastication and diarrhoea may be responsible and gastric achlorhydria can play a rôle in respect to faulty absorption. An improper utilization of hæmoglobin-forming materials may also produce these anæmias. Information regarding this mechanism is scanty. Certain substances, such as chlorophyll, apparently can enhance the utilization of iron, but little if anything is known regarding the regulation of iron metabolism as compared, for example, with calcium. Loss of iron together with other blood building material is also a common cause of these anæmias. This happens from blood loss, especially of chronic nature, and by the fœtus obtaining its supplies from the expectant mother.

More than one of these mechanisms is apt to be operative in a given case as, for example, in pregnancy, in which inadequate diet, achlorhydria or otherwise altered digestion and the presence of the fœtus are all likely to play a rôle. These anæmias, which respond to iron, are especially frequent in women before the menopause. The part played by menstruation is interesting to speculate on. 'Idiopathic' hypochromic anæmia, both of the very mild and of the severe long-standing type, belongs in this group, as does the now rare condition chlorosis. 'Iron' deficiency anæmias are also common in infants and children, in pregnancy and in individuals with 'chronic indigestion', chronic ill health and anxieties as their presenting symptoms. Many cases can be attributed to repeated loss of blood, and this factor, operating together with others, is very frequently observed.

FACTORS ASSOCIATED WITH IRON DEFICIENCY AND MULTIPLE DEFICIENCY

Iron alone cannot make hæmoglobin or red blood cells, and there are other blood building factors that may be deficient, particularly when 'iron' deficiency exists; for example, material contained in that fraction of liver separated by Whipple, which is effective in anæmia due to repeated losses of blood. This material is distinct from the material effective in pernicious anæmia. Indeed, the exact rôle that many elements of the diet play in the manufacture and maintenance of normal blood is yet to be learned. Whipple has, however, placed on a secure quantitative basis the influence of food on blood regeneration. The strikingly beneficial effect of proper doses of iron in what may be conveniently considered 'iron' deficiency anæmias certainly may not be wholly dependent on deficiency of this element. Much more information is desirable.

There is very little evidence that in man deficiency of copper plays a significant rôle in the production of anæmia. It may perhaps do so occasionally in infants. In human anæmia the copper of the blood is usually increased. While it is true that in young children, when iron is supplemented by copper, it sometimes enhances the rate of hæmoglobin formation, in adults copper therapy apparently is very seldom of value. These remarks do not detract from the important observations of Hart and Steenbock concerning the rôle of copper in iron metabolism, as shown by studies on certain experimental animals. Traces of copper are usual in pharmaceutical iron preparations and thus are given when iron is prescribed. It is not difficult to create serious copper poisoning by administering relatively small amounts of copper.

In man, dietary deficiency is seldom confined strictly to one factor, nor are the results of disturbances of gastric secretion, of defects of intestinal absorption, or of utilization necessarily concerned in only one type of metabolic process. The combined deficiency of 'iron' and the material effective in pernicious anæmia is not rare in the same individual. Other double and multiple deficiencies occur in patients with anæmia, but usually one of the deficiencies is outstanding. Whole liver, owing to a factor or factors not effective in pernicious anæmia, as well as iron, can regenerate the blood in the anæmia due to chronic blood loss. The

main effect of liver cannot be attributed to its iron content. It is circumstances like these that make it necessary to appreciate that the term 'iron' deficiency does not adequately describe all cases placed under this heading. The withdrawal from the tissues of material to make hæmoglobin, the influence of substances or physiologic mechanisms on the utilization of iron and hæmoglobin building substances must be studied further before there is final knowledge concerning 'iron' deficiency anæmias. In observing the influence of specific substances the supplementary effect of diet must not be forgotten, and it is obvious that an adequate diet should be taken by everybody.

INHIBITORY FACTORS

The mechanisms outlined for the production of nutritional deficiency anæmias are the same as those for the production of any dietary deficient condition. In addition, it is important to appreciate that there are factors which may inhibit nutrition and intensify a deficient state. Thus, in anæmia they inhibit blood formation and hinder the action of such therapeutic agents as liver extract and iron. Such factors are infection, serious damage to vital organs, arteriosclerosis and increased or altered metabolism. It also must be recognized that the body should always contain an appropriate reserve supply of nutrient substances readily available for extra demands. The individual whose body has received for a long time only just enough of a nutritional factor, such as a vitamin or mineral, to maintain health may be precipitated into the zone of partial deficiency with the advent of infection. In this instance no clinical signs of deficiency are apt to become apparent. If, however, the individual's nutrition remains for some time close to the level permitting the appearance of symptoms readily attributable to deficiency, and infection ensues, then anæmia, polyneuritis, scurvy or some other nutritional defect is likely to become manifest according to the exact circumstances in the given case. Knowledge of partial deficiency states or nutritional instability in man is meagre. It is highly desirable to obtain information as to how to determine precisely such states; only a few hints have been given. It is a problem of concern to the health of the world.

DIAGNOSIS

One cannot, of course, adequately treat a patient until a detailed diagnosis has been made. The hasty administration of both liver and iron before the actual needs of the patient have been intelligently considered may lead to embarrassing circumstances. If the anæmic patient does not have pernicious anæmia, how unfortunate it is to have prescribed both liver and iron and later on when the blood is approximately normal to be unable to determine whether or not he should continue with liver for the rest of his life.

A catalogue of conditions that may be thought of in establishing diagnoses of anæmias due to or associated with nutritional deficiency will serve no useful purpose. A few aspects of diagnosis, however, will be considered. The concept of establishing a diagnosis of a deficient state rather than simply of anæmia will probably lead to earlier diagnosis and better treatment. Pernicious anæmia should be diagnosed earlier than it usually is. It is often not diagnosed until the patient has had definite symptoms for a year or more attributable to a deficiency of the material he needs. Early diagnosis and complete treatment are important in order to prevent the development of neural lesions and to save suffering. The disease should not be allowed to progress until one sees the typical textbook picture of the blood, a patient with a palpable spleen and a grapefruit coloured complexion or other signs of pronounced relapse or long-standing illness. Early diagnosis implies detailed attention to the patient's history and being alert to detect the disease in patients with 'chronic indigestion', a tendency to loose stools, atrophic or recurrent sore tongue, slight signs of neural involvement, achlorhydria and slight macrocytosis of

the red blood cells. The use of the tuning fork to detect impaired vibration sense and careful scrutiny of a blood smear are simple but invaluable aids to diagnosis. Multiple sclerosis, spinal cord tumours and other neurologic conditions must be excluded. The symptoms of *anæmia per se*, such as palpitation, dyspnoea and impaired kidney function, for example, should not cause an established diagnosis of heart or kidney disease. The *anæmia* associated with nitrogen retention may be macrocytic, and lesser degrees of increased mean corpuscular volume occur in liver disorders and in other conditions than the macrocytic *anæmias* responding regularly to liver and allied therapy.

A common error is to diagnose pernicious *anæmia* when a patient has chronic *anæmia* due to a fundamental depressed dysfunction of the bone marrow for which little can be done. This happens especially when the colour index is not decreased and large red cells are present. This state of affairs may occur in so-called idiopathic chronic 'aplastic' *anæmia* and in comparable states arising from benzene and other poisons. Under such circumstances the correct diagnosis may also be one of the types of leukaemia without elevation of the white blood cells, occasionally Hodgkin's disease with invasion of the bone marrow and involvement of the bone marrow with tumour metastases or tuberculosis. Idiopathic chronic purpura hæmorrhagica (thrombocytopenic purpura) is to be distinguished from these cases.

Cases called idiopathic chronic 'aplastic' or aregenerative *anæmia* may represent several conditions, and more knowledge concerning this group is much to be desired. Some, if not all, cases termed chronic malignant neutropenia, panmyelophthisis, hæmorrhagic aleukia and achrestic *anæmia* belong to this group. In these chronic cases the bone marrow may vary widely in appearance from an anatomic fatty aplasia to marked hyperplasia with physiologic inadequacy, either complete or with evidences of attempted regeneration of blood. Although usually there is a slow, progressive decrease of all three formed elements in the peripheral blood, which originate in the bone marrow, occasionally a slight and very rarely a marked temporary 'spontaneous' remission may occur, thus simulating the natural course of pernicious *anæmia*. Bleeding associated with reduction of blood platelets is more common than in pernicious *anæmia*, and persistent leukopenia is a feature. Macrocytic *anæmia* is the rule, but liver extract, even when given in very large doses parenterally, calls forth no worth while response, although rarely a weak response results which is only temporary. Repeated transfusions of blood offer the best palliative treatment. Gastric achlorhydria is only sometimes present, and signs of involvement of the neural system, such as occur in pernicious *anæmia*, are absent. Rarely is the tongue atrophic, and distinctive signs of glossitis do not seem to occur. Fever, simulating that seen in untreated pernicious *anæmia*, increased pigmentation of the skin and terminal ulcerations in the mouth are not unusual.

The occurrence of concomitant conditions must not cause the diagnosis of pernicious *anæmia* or *anæmia* associated with nutritional deficiency to be overlooked. Chronic arthritis is common in pernicious *anæmia* and may lead to considering neural symptoms due to joint disease. Gall-bladder disease occurs in about 25 per cent of cases of pernicious *anæmia* and in such cases operations have been done without an appreciation of the existence of pernicious *anæmia*. The coincidence of diabetes mellitus and pernicious *anæmia* in the same individual, although rare, is more frequent than can be accounted for by chance. I have noted that the incidence of diabetes in relatives of pernicious *anæmia* patients is distinctly more common than in a control group. Such relationships offer interesting speculations.

In many cases infection may be the chief cause of *anæmia*, and removal of the cause the important aspect in treatment. In such cases, however, defective nutrition may arise and intensify the *anæmia*, and this aspect

of diagnosis should not be overlooked. Thus iron therapy may be delayed when it would be distinctly effective, especially as the infection subsides.

The occurrence of slight splenomegaly in 'idiopathic' hypochromic *anæmia* and in some cases of chronic *anæmia* arising in children has led to the diagnosis of splenic *anæmia* and splenectomy, when full doses of iron would have cured the condition and permitted the enlarged spleen to recede behind the ribs.

Menorrhagia may be a symptom of 'idiopathic' hypochromic *anæmia* as well as a condition acting to intensify the defective nutritional state. The wrong diagnosis may lead to only local treatment of the uterus when full doses of iron will cause the menstruation to become normal.

Removal of 'hookworms' alone will not alleviate the *anæmia* so common in patients infected with these parasites. The defective nutrition usually present must be recognized. Full doses of iron will often promptly restore the blood to normal, which will take place more rapidly if the diet is also made complete.

TREATMENT

In prescribing for *anæmias* arising from nutritional deficiency, the realization that one is treating a patient with a generally deficient nutritional state should be paramount. The *anæmia* is often but one symptom of the defective nutrition. For example, in pernicious *anæmia* the tongue and neural symptoms are dependent on deficiency, and in 'idiopathic' hypochromic *anæmia* dystrophy of the nails and alteration in the mucosa of the uterus, leading to abnormal bleeding, appear to be of nutritional deficiency origin. The atrophy of the papillæ of the tongue in the latter condition, as well as certain other manifestations, quite probably are not due to iron deficiency *per se*, but they may be decreased by iron therapy, perhaps because of the better appetite that ensues, which results in partaking of a better diet. Here again, however, more knowledge is needed, for example, concerning the possible interrelated effects of iron and the vitamin B complex.

The object of treatment is not only to eradicate symptoms or place them under control, but also to restore reserve supplies and the patient's nutritional state to normal for the rest of his life. The aim must be not only to return the hæmoglobin and red blood cells to normal levels and keep them there but also to maintain the blood normal in all respects so that the colour index, cell size and volume are normal. But the amount of material necessary to accomplish this may be less than the amount needed to prevent the development or progress of other disorders, such as neural manifestations in pernicious *anæmia*—an important point to appreciate. With liver extract, stomach or other preparations effective in pernicious *anæmia*, the common error is to give too little, particularly after the blood has become approximately normal. Each case is an individual problem. Indeed, the amount of parenterally given liver extract required in macrocytic *anæmia* may vary tenfold. The variation for the optimal dose of iron is apparently less. The cases requiring the largest amount of iron are severe ones of long-standing 'idiopathic' hypochromic *anæmia*, while among the cases responding maximally to one-third or even one-fourth of this amount are those of chronic blood loss without achlorhydria or chronic dietary or digestive disorder. In the former condition maintenance of iron therapy is often necessary to prevent relapse; in the latter state the patient is truly cured when the blood and body reserves become normal and he continues to take a satisfactory diet. In practice it is wise to use a large dose, one certain to cover the patient's requirements. Recovery should not be delayed by economy of a relatively inexpensive remedy. To give somewhat too much iron does no harm, except in rare instances of distinct intolerance.

Remedial substances for many nutritional deficiencies may be given parenterally as well as orally. Thus, optimal amounts can easily enter the body and defective absorption be overcome. Some of these substances,

such as liver extract, are in the range of from fifty to hundred times as effective by the parenteral route. This route is the one of choice for liver extract in sick individuals, those requiring large doses or those with spinal cord lesions. The procedure is economical and convenient, and it gives assurance of sufficient material entering the body on selection of an appropriate dose for the given patient.

There is no need for the parenteral use of iron except, perhaps, in an extremely rare case. A distinctly effective daily dose parenterally is close to a toxic dose. Thus the injection of small doses every few days is to be deplored. The problem of what preparation of inorganic iron or liver extract or allied substance to use resolves itself into choosing any one of many effective preparations and giving an appropriate amount of that particular preparation for the given patient. The daily dose of the iron salts is variable, the maximum for iron and ammonium citrate being in the range of 6 gm., and of ferrous sulphate in the range of 1 gm. Among available liver and allied products there is a wide difference in potency when compared with whole calf's liver or with the amount of material from which an extract originally came. The use of liver extract and iron together should be judiciously decided. The development of hypochromic red cells or a lag in haemoglobin production in a patient with pernicious anaemia calls for both. Some patients, particularly benefited by iron, may perhaps have recovery speeded by the use of these two substances. The effectiveness of suboptimal doses of iron with liver in hypochromic anaemias may be no greater than an optimal dose of iron. The addition of Whipple's liver factor to iron may be of distinct value in certain cases. The important matters to bear in mind are that either liver extract of the type effective in pernicious anaemia or iron will be the chief agents to use and that combinations employed at random will often waste the patient's money and may prevent an understanding of the needs of the patient. It must be remembered, also, that treatment means still more than administering substances to offset deficiency. Satisfaction with great improvement in the patient is not enough; he must be made as well as possible. All aspects of the case must be attended to, including the individual's manifold problems of thought and action.

PREVENTION

The prevention of illness is much simpler and more desirable than successful therapy of the sick man. A diet nicely adjusted with respect to all its constituents at an optimum—not a usual—level permits development of the organism to proceed uninterruptedly and the health of the individual to be maintained as near

the optimum as possible. Ideally, nutritional defects should be detected when individuals begin to pass into the zone of suboptimal nutrition and thus prevent the development of disease. At present this state is usually difficult to prove but often can be suspected, particularly by a detailed study and careful evaluation of the dietary history. The physician should appreciate when he prescribes a diet for one reason or another for more than brief periods of time that it must be complete. It is not very rare to be able to detect nutritional disturbance due to prescribed diets as, for example, for peptic ulcer and chronic nephritis.

Certainly a good diet throughout life will aid in the prevention of anaemia. Consideration of such matters as are mentioned later will do likewise. A careful study of near relatives of a pernicious anaemia patient may reveal in one or more of them gastric achlorhydria with or without slight abnormality of the blood, although the individual considers himself well. In view of the familial incidence of pernicious anaemia, the presence of achlorhydria in such a case may indicate a 'latent' one of pernicious anaemia. Liver therapy for that person may prevent, perhaps, the development of distinctive disease. The frequency of hypochromic anaemia during the first year of life in babies born of anemic mothers may be minimized if such infants are given small doses of iron as a routine procedure. The development of hypochromic anaemia in pregnancy is common. Iron administration frequently can prevent the development of hypochromic anaemia in pregnant women and thus aid to prevent anaemia in the child. Anaemia will also become less frequent if an attitude is taken that all edentulous individuals must have properly fitted false teeth and that the diet for all patients with 'chronic indigestion' should be very carefully regulated. It is of great importance to recognize the frequency with which repeated losses of menstrual blood in slight excess of normal lead to anaemia, as well as repeated small losses of blood from any source. Attention given early to this state of affairs will also minimize the occurrence of anaemia.

CONCLUSION

The practice of prevention is the ultimate goal of the physician. Success often depends on inherent interest, on attention to detail and on an understanding of the etiologic and physiologic mechanisms involved in a given case. There is much more to be learned about the anaemias and nutrition. With the progress of knowledge there should be much less suffering from disorders due to, or associated with, nutritional deficiency.

Reviews

MANSON'S TROPICAL DISEASES: A MANUAL OF THE DISEASES OF WARM CLIMATES.—Edited by P. H. Manson-Bahr, D.S.O., M.A., M.D., D.T.M. & H. (Cantab.), F.R.C.P. (Lond.). Tenth Edition. Revised. 1935. Cassell and Company, Limited, London. Pp. xx plus 1003, with 22 coloured plates, 15 half-tone plates, 381 figures in the text, 6 maps and 38 charts. Price, 31s. 6d.

We have for some time thought that the vast subject of tropical medicine should be split up; it has seemed to us to be an impossibility for one man to write accurately on such a diversity of subjects, amongst which he must of necessity only have had any significant practical experience of a very limited number. Yet, in the tenth edition of this book, Dr. Philip Manson-Bahr has achieved a most remarkable success, and, though we refuse to retreat from our position, we do not admit to having suffered a reverse.

First of all, one is impressed by the enormous amount of work that must have been put into this book; every section has been most carefully rewritten, and on each subject all the work which has been done during the six years that intervened between the ninth and tenth editions has been most carefully weighed up and the important observations have been skilfully interwoven with the best of the material of the previous edition. More than this, it is obvious that the author has had personal contact with those who have had first-hand experience of the subjects about which he writes. The author in his preface says that no man can be an expert on the diversity of subjects that tropical medicine presents; this might be said of the judge on the bench with reference to many cases he has to try in which various experts give evidence, but we know that the man with personal technical knowledge is not necessarily the best judge. Dr. Manson-Bahr has

proved himself a very good judge; in the position he holds at the School of Tropical Medicine he has been able to cross-question witnesses and to elicit details that 'evidence on commission' could not possibly provide; he has taken full advantage of this opportunity and has presented to us a most excellent summing up.

As we are told in the preface, in order to make room for new matter a certain amount of jettisoning has had to be done, and for this purpose the author selected what he calls 'non-essential scientific matter in the realm of medical zoology'. Whatever this may be, we did not miss it, and, though we have not been curious enough to compare the last two editions page by page, we have noticed that the present edition is increased by about a hundred pages; it has now reached its thousand pages which is about the limit for a single volume. Whether matter is essential or non-essential will always be a question for the decision of the individual reader, but, lest it should be thought that some of the very useful details of laboratory technique, and the descriptions and illustrations of protozoa and helminths have been omitted, we will mention that they have not; they still form an important feature of the book and make it a much more complete book of reference for the worker in the tropics than certain other books on tropical medicine that deal with the clinical side only.

We have of course certain criticisms to make. We cannot understand why the author has only devoted two lines to the Indian form of endemic typhus whereas to the Malayan forms, described much later, he has devoted a section. Fifteen years ago such an attitude might have been justifiable, as there were many who thought that the Indian endemic typhus that was described in 1917 was largely a figment in the imagination of one observer. There is now abundant proof that this observer was right, and, even if the aetiology has not been worked out as satisfactorily, as in other countries such as Malaya, the diagnosis of a large number of cases from many parts of India, based on irrefutable serological evidence, has shown the widespread existence of this disease.

In this same section the author says 'the disease known as typhus has two main manifestations—the first and better known is *true typhus*—a louse-borne disease of great communicability from one person to another in times of overcrowding amongst an unclean population, and characterized by its tendency to form epidemics; the second (*endemic typhus*), a disease primarily of rodents which is transmitted from rat to man by rat-fleas'. In the book the above sentence is separated into two parts by a table which demonstrates very clearly that the generalization is not justified, as the table shows that other rodents, besides the rat, and other animals have been incriminated as carriers and a variety of insects as the vectors. It would have been so easy to have included these in the generalization.

A subsequent reference to typhus as a louse-born disease is obviously a misprint.

In our review of the last edition we objected to the statement that kala-azar, 'unlike malaria, shows a predilection for the acclimatized—the natives'. The sentence still remains. It is certainly not true in India, as Europeans living in the highly endemic areas in Calcutta were proportionately just as frequently attacked as were Indians. Then, again what does the author mean by *natives*? Coolies that have come from over a thousand miles away to work in the tea gardens of Assam are certainly not natives of Assam (they are natives of somewhere of course, so are we all!), and they have been shown to be very susceptible. On the other hand another statement regarding the Wassermann reaction in kala-azar, to which attention was drawn, has been modified and corrected.

In referring to the nasal infections demonstrated by Forkner and Zia in China, the author misspells Forkner's name; but this is possibly a misprint as the name appears correctly spelt elsewhere.

We must repeat our protest against the illustration of a case of kala-azar on page 153, because it is a

caricature, not a typical example. Further, in our experience cases even approximating that degree of splenic and hepatic enlargement are more often not kala-azar. We must also initiate a protest against the new illustration on the opposite page; in the first place it doesn't show anything at all except a pair of legs. Secondly, we do not think that the condition that it was meant to depict (we have seen a painting of the same pair of feet in the Wellcome Museum) is a characteristic of kala-azar in the European. In the Indian, particularly in the fair Indian, and in the Anglo-Indian, even those with a very small percentage of Indian blood, there are wide variations in the pigmentation in different parts of the body, and the parts subject to pressure are often hyperpigmented.

The suggestion is made that, following on the observations of Hu and Cash that parasites can be found in the skin in kala-azar cases, a diagnosis might be made safely by cutting out a piece of skin and examining it for leishmania. We have seen a section of skin from a case of kala-azar showing leishmania, but we know from experience that it is a very unsatisfactory method and in 20 consecutive cases of kala-azar we failed to demonstrate leishmania by this method; it is of course the routine method of diagnosis of dermal leishmaniasis. On the other hand, the author has underestimated the value of examination of the peripheral blood; the parasite can be found in at least 60 per cent, and not 20 as he says, and not only in Assam and Madras but in any of the endemic areas in India.

In the paragraphs on dermal leishmaniasis, a little confusion has arisen. There is a xanthoma form, known as *Xanthoma tuberosum multiplex*, which is quite unmistakable, and in which the parasites have been observed in the peripheral blood (figure 36). In the first place, we, the late Colonel Acton and the reviewer, did not describe any condition as *Xanthoma tuberosum multiplex*, but we described a xanthoma (on account of its colour) type, which Colonel Acton pointed out resembled the condition described by dermatologists in other countries as *Xanthoma tuberosum multiplex*. Secondly, parasites have not been found in the peripheral blood in this condition any more than in any other type of dermal leishmaniasis; actually out of a very large number examined the parasites have been found in the blood in two cases only. Thirdly, figure 36 is not a photograph of a case of the xanthoma type of dermal leishmaniasis but of the ordinary nodular type.

Despite the number of the points on which we differ from the author, we consider that this section on kala-azar provides an accurate summary of the subject, with surprisingly few omissions, considering that it has been condensed into 22 pages, and very few mistakes. Other sections, such as that on yellow fever, seem to us to be wholly excellent.

There are 37 plates, 22 of which are in colour; with one exception they are all useful and of a high standard of reproduction; plate XI is very crude. The index appears to be complete but it has one very annoying feature; if you look up *Malta fever*, for example, you find '(see Undulant fever)'. It would have cost very little extra trouble to have added '271', and it would save the reader from having to look up *Undulant fever*. Admittedly, under this last-named heading there are 36 sub-titles, but nine times out of ten all the reader wants is an indication of where the section begins. This is a small point but this omission has been one of frequent annoyance to the reviewer.

This edition is a better balanced and more complete book than the last one, and it would be difficult to give higher praise. It is larger by nearly a hundred pages but the price has been maintained at the same very reasonable level; this is obviously only possible on account of the thousands of copies that are sold. Altogether it is a very remarkable achievement.

L. E. N.

WOMAN: AN HISTORICAL, GYNÆCOLOGICAL AND ANTHROPOLOGICAL COMPENDIUM.—By H. H. Ploss, M. Bartels and P. Bartels. Edited by E. J. Dingwall. Volumes I, II and III. 1935. William Heinemann (Medical Books), Limited, London. Pp. xiii plus 655 in volume I, Pp. xii plus 820 in volume II and Pp. viii plus 543 in volume III, with more than 1,000 illustrations in black and white and 7 coloured plates in three volumes. Price, £8 8s.

THIS book is a classic, which has already gone through eleven editions in the German language. The first edition appeared in 1885 and since that date it has had many editors and has been subject to a number of different environmental influences—we do not suppose that it was read openly by our late-Victorian forbears, but it was no doubt obtainable in those sinister little shops that specialized in rubber goods and were a characteristic feature of the west end of London but which have now largely disappeared as all their wares are now sold openly in shops of good repute; in those days it was probably bought by the medical student—who even if he did not understand German understood the pictures—covered with brown paper, labelled 'Chemistry', and locked away in his most secret drawer when it was not being read or lent to a friend, but to-day in the ultra-modern family it will no doubt be left about in the sitting room as the family photograph album used to be. These variations in the internal and external influences—its numerous editors and its progress from the stuffy shop and the locked drawer to the fresh air of the booksellers' window and the suburban front parlour—have had a liberalizing effect on the book, for which it can now be claimed legitimately that it has not been unduly prejudiced by one particular age and that it does not represent any one school of thought.

This is the first English edition. The text bears none of the stigmata of a translation, and curiously enough it is in the illustrations that the fact is betrayed. The editor has not made a direct translation from the last German edition but has also used the earlier editions, and has, as he says in the preface, taken certain liberties with the text and omitted and altered conclusions and opinions that recent investigation has shown to be incorrect. Further, he has made his own interpolations and added data from English sources to supplement figures from Germany and other European countries.

The theme is woman—in her infinite variety, as an organism whose morphology, whose cultural and uncultured characteristics, whose reactions to, and effects on, the medium in which she lives, and whose symbiotic habits have been carefully studied and are described accurately and with a wealth of detail. Emphasis has perhaps been laid on morphology and the anatomical features of the genital organs and the accessory sex characteristics, as the first volume contains more illustrations of female genitalia than the reviewer has hitherto seen between the covers of any book, medical or otherwise, but the whole subject is presented in a matter-of-fact manner and there is nothing unpleasant or suggestive in the text or illustrations.

It is of course not only anatomical features of the woman of all races that are dealt with, but the physiological and psychological characteristics. Sexual, ritual, marriage customs, the status of women in different ages and different countries, the history of prostitution, child marriage, midwifery and gynæcology through the ages, abortion, symbolism and mysticism of the puerperium, lactation, the climacteric, and a hundred and one other aspects of woman and her functions and activities form the chapter and section headings.

The book is a treasure house of knowledge, invaluable to the anthropologist, the gynæcologist, the sociologist, and above all the professional writer of pseudo-scientific pornographic literature. In it the practitioner will find detailed information about women that he ought to

have at his disposal and much else that he may conceivably turn to useful account, and he will not find this information collected together in any other book; it is a unique publication.

L. E. N.

THE MODERN TREATMENT OF BURNS AND SCALDS.—By P. H. Mitchiner, M.D., M.S. (Lond.), F.R.C.S. (Eng.). 1935. Baillière, Tindall and Cox, London. Pp. ix plus 64, with 12 plates (2 coloured). Price, 5s.

ALTHOUGH the subject of burns and scalds is often relegated to the domain of minor surgery, the successful treatment of these distressing injuries is by no means easily accomplished. The advent of the tannic-acid method of treatment is a great improvement on the past, but its technique has to be mastered. For this reason alone, this excellent and authoritative monograph by Mr. Mitchiner will be welcomed by all.

This little book is divided into six chapters, of which the first three deal with general principles, first-aid treatment, prevention of shock and the final application of the compress. Special burns are considered in the next chapter. A consideration of the mortality of burns and scalds in chapter V provides interesting reading. Other uses of tannic acid are briefly outlined in the concluding chapter. The suggested first-aid outfit would be generally useful. An adequate bibliography and index are also appended.

The tannic-acid spray, with which every one is now familiar, has unfortunately its limitations. The author has suggested a simple and satisfactory method of treatment—equally applicable to both first aid and for a final dressing—the tannic-acid compress. It has been recommended as a safe, satisfactory and comfortable dressing for all burns, but it is not to be touched until the coagulum separates from the injured area. For a satisfactory stable lotion which will keep for at least two months, the author prefers a solution of 2 to 2.5 per cent tannic acid in 1/2,000 perchloride of mercury. In our hands, a similar solution, containing 1/1,000 acriflavine has given satisfactory results in spite of the two obvious drawbacks of staining of linen and formation of a softer coagulum. There is one inexplicable omission in this excellent book; there is no mention of a prophylactic dose of anti-tetanic serum. It has been our practice to use it as a routine method in our wards.

The printing, get-up and illustrations are all excellent. The general practitioner who buys this book will readily discover that he has made a profitable investment.

P. N. R.

THE HAIR AND SCALP: A CLINICAL STUDY. (WITH A CHAPTER ON HIRSUTIES).—By A. Savill, M.A., M.D. (Glas.), M.R.C.P.I. 1935. Edward Arnold and Company, London. Pp. vii plus 288. Illustrated. Price, 12s. 6d.

THIS is an unusual book in some ways for certain sections of it are devoted to the art and theory of hair dressing and an interesting chapter contributed by W. T. Astbury on the molecular structure and elastic properties of hair. These aspects of the subject although not strictly in the province of the dermatologist are of great value as they supply information not elsewhere obtainable which is of great assistance in the understanding and subsequent rectifying of certain hair conditions caused by modern hair dressing methods, for which he may be consulted.

The principal part of the book is naturally devoted to definite diseases of the hair and scalp and contains an immense amount of information; it is, however, rather badly arranged for some chapters are devoted to discussions of certain signs which necessitates frequent references backwards and forwards to other parts of the book where the diseases in which these signs occur are described; other chapters are devoted to diseases themselves. The book would be more easily read if

the symptoms and signs were all tabulated at the beginning and the remainder devoted to diseases only, this is a method which has been used in certain well-known books on general dermatology with excellent effect in simplifying the subject for a beginner.

The authoress has also attempted to emphasize the relative importance of the various diseases and signs by the use of three or four different styles of type, it is difficult to carry the relative value in one's mind while reading the book and rather spoils the appearance of many pages.

These criticisms are only in detail, however, for the information needed for successful treating and understanding of the various diseases of the hair and scalp is all in the book and it is only suggested that it might be still more valuable if better arranged. Special reference should be made to the chapters dealing with the scaly conditions of the scalp with or without true seborrhœa for in the chapters devoted to this very confused subject the authoress has effected a very clear and reasonable disentanglement, and this alone will make the book worth reading.

Like the beginning, the end of the book contains information not easily obtainable in a book on dermatology however comprehensive, and the penultimate chapter is devoted to hair dyes harmful and harmless, and the last chapter to the treatment of hirsuties the latter being given in detail. Finally there are a few useful formulæ.

The book is well produced and is printed on heavy art paper, which is not an objection in this case as the small size of the book does not make it too heavy. There are no coloured plates but the numerous photographic reproductions are excellent.

P. A. M.

A TEXTBOOK OF SURGICAL PATHOLOGY.—By C. F. W. Illingworth, M.D., F.R.C.S. (Edin.), and B. M. Dick, M.B., F.R.C.S. (Edin.). Second Edition. 1935. J. and A. Churchill, Limited, London. Pp. x plus 719, with 301 illustrations. Price, 36s.

MESSRS. ILLINGWORTH AND DICK are to be congratulated for bringing out a second edition of their admirable textbook of surgical pathology within three years of its first publication. As this new edition includes many interesting subjects of recent development, the authors have found it unavoidable to add slightly to the bulk of the volume. We have little doubt that this book will continue to maintain its high position in the surgical sphere all over the world, particularly amongst the English-speaking nations.

It will not be an exaggeration to say that this treatise is an embodiment of the pathological aspects of the British school of surgery. The first eight chapters deal with general pathology in relation to surgical conditions and the rest of the book has been arranged systematically in different sections each of which is full of all the modern ideas on the subject. The whole book has been written in a style which is at once impressive, easy to read, and stimulating, and one never feels it monotonous to go through its pages. A very noteworthy feature of the book is the inclusion, at the end of each chapter, of a well-chosen bibliography which, though not exhaustive, is undoubtedly comprehensive, and is likely to be very helpful to those in search of further information. The authors have also enriched this edition by including many new subjects. Special mention may be made of the section on diseases of the bone which has been thoroughly rewritten in the light of the recent developments, as also leukoplakia of the tongue, xanthomatosis of bones, granulosa-cell tumour of the ovary, the islet-cell tumour of the pancreas, post-traumatic osteodystrophy and the pre-natal muscular dystrophy.

While there can be no two opinions regarding the excellent way in which the book has been written and the wealth of information and new ideas which have been incorporated in it, we cannot but draw the attention of the writers to the following points.

The outstanding defect throughout the book is the poor quality of its illustrations, specially the photographs, which have failed to reproduce what they are meant to represent, and it is indeed difficult to find anything of the magnificent collections of the Edinburgh Royal College in these diagrams. Certainly the quality of the paper could have been improved for better reproduction.

We have failed to find any improvement in the chapter on actinomycosis which the authors have particularly mentioned in the preface. If they had left out the bacteriological aspect of the subject, many inaccuracies might have been avoided. Lastly, we think it would have been better had vague terms like 'tumour', 'cancers', 'ulcerous', 'alveolar carcinoma', 'epithelioma', 'endothelial sarcoma', etc., not found a place in a scientific book of such a high order.

M. N. D.

A TEXTBOOK OF FRACTURES AND DISLOCATIONS COVERING THEIR PATHOLOGY, DIAGNOSIS AND TREATMENT.—By K. Speed, S.B., M.D., F.A.C.S. Third Edition. Thoroughly Revised. 1935. Henry Kimpton, London. Pp. 1000. Illustrated with 1,042 engravings. Price, 50s.

THIS compendious production runs to 1000 pages with 1,042 illustrations. The word compendious is used in its literal sense; the work is a veritable encyclopædia in one volume on bone injuries and dislocations. On this account, and reason of its price, it is hardly likely to appeal to the average student in search of a textbook on fractures. Essentially a book for the specialist, it might find a place as a book of reference in Indian district hospitals where the occasional fracture, no matter how rare and peculiar, must be treated locally with every other kind of case.

From a perusal of publisher's lists it would appear that there is some risk of congestion among the works devoted to fractures. Life to-day however is attended by a greater risk of accident than ever before so that it is but a sign of the times. These books may be divided broadly into two classes. Those devoted to the exposition of a particular school of teaching, as for example, the recent excellent translation of Bohler's work by Hey Groves, and those more liberal in outlook which attempt to present the best from many schools of thought. This book belongs to the latter class and coming from the pen of a member of the Central Committee on Fractures of the American College of Surgeons it admirably fills the purpose of a comprehensive guide to the subject. It is evidently based on enormous personal experience and is consequently free from fads and inadequately tested ideas.

This is the third edition and those who know it in its earlier forms will find the revision has produced many satisfying changes. The futile habit of reproducing hundreds of indistinct radiographs in half-tone has been carefully avoided. In the comparatively rare instances where an x-ray film has been actually reproduced, it has been chosen with care, so that something more than the usual smudge is presented. Many hundreds of carefully prepared tracings have been substituted and these line drawings show all that must have been visible to the surgeon in the original films. It is doubtful however in spite of their excellence whether quite so many need have been included. They increase the size of the book without commensurate value to the purchaser. Figures 442 and 497 may be quoted as examples taken at random.

A very extensive literature is listed after each chapter, most of which will be out of reach of the reader in India. Unlike many American and foreign books however there is rather more than the usual meagre reference to English works and periodicals. The style is terse and to the point making for easy reading, the English being singularly free from those peculiarities we have learned to meet without surprise in books from America. Altogether a book which can be recommended to the general surgeon in this country who

requires something more searching than the usual textbook as a guide to this difficult and responsible branch of surgery.

H. R. R.

THE FOOT.—By Norman C. Lake, M.D., M.S., D.Sc. (Lond.), F.R.C.S. (Eng.). 1935. Baillière, Tindall and Cox, London. Pp. vii plus 330, with 95 illustrations. Price, 12s. 6d.

In this interesting monograph, the author has dealt with an important subject, which generally receives but scant attention in an over-burdened medical curriculum. It is intended for the practitioner and the general surgeon and is, in short, a manual dealing with the evolution, anatomy, physiology and diseases of the foot from the standpoint both of theory and practice. The major orthopaedic procedures connected with the treatment of severe talipes have been deliberately left out.

The book consists of twenty-six chapters; the first two dealing with the evolution and development of the foot are full of interest. It may be mentioned here that more recent work tends to emphasize the fundamental similarity in architecture of the foot of the chimpanzee and that of man. The fact that the human foot, adapted as it is for walking on the ground, bears a closer resemblance to the ape foot as used in arboreal than in terrestrial locomotion, may be regarded as satisfactory evidence of man's arboreal ancestry. It would also suggest that the essential features of man's foot were acquired at an early stage of his terrestrial existence, rather than after long apprenticeship on the ground. The author is, however, forced to the conclusion that the evolutionary destiny of the human foot is to the production of a rigid structure, having an arched form but devoid of any movements other than that at the ankle and toe joints. The tendency of the modern foot to become rigid may therefore be regarded as an evolutionary one not dependent upon the adoption of footwear.

The evolution of footwear is worthy of careful study. In both sexes, the heel should be the weight-bearing part of the foot. The anterior portion, relatively weak and degenerate, is merely intended for the preservation of balance and for assistance in the 'take off'. On the whole, modern male footwear, if not quite ideal, may be regarded at least as a happy compromise with utility and as such cannot be subjected to much serious criticism. In the female, wearing of high heels brings about effects which are in opposition to the evolutionary trend in that it throws the strain on the anterior half of the foot and so reverses the natural indication as to the destiny of the anterior and posterior limbs of the longitudinal arch. The formation and significance of the arch receives careful consideration in the chapter on flat foot and the author is inclined to the older view, *viz.*, that the arch is a static structure, depending for its maintenance, when the foot is inactive, chiefly upon the conformation of the bones and the strength of ligaments and other soft structures on the plantar aspect. But the modern school of orthopaedists holds the view that there is no such structural arch and that the observed arch in the living foot is pulled up by the postural tonus of the muscles, with the foot inactive. Sir Arthur Keith's description of the evolution of a functional arch, by the transference of muscular attachment from one part of the foot to another, appear to lend powerful support to the postural theory.

Hallux valgus has also received careful attention. The older description of this condition as a purely local deformity is abandoned in favour of the view that regards it as but a part of a much more general derangement of the foot. In the author's opinion, the most satisfactory operation is the one in which the base of the proximal phalanx is removed, while the metatarsal head, except for some slight modelling and removal of the osteophytes, is left intact. It is important to retain the articular cartilage over the phalangeal base, since the object is to produce a

movable joint. Exigencies of space prevent us from referring to the remaining chapters in detail. It may be briefly stated that other deformities of the foot, painful heels and a number of miscellaneous conditions have been adequately dealt with.

In short, it is an excellent book and although there may be some divergence of opinion on many points, it can be thoroughly recommended. We have no hesitation in saying that the author has been eminently successful in the objective with which this manual was written. But we think that the utility of the book would be considerably enhanced if in a future edition a suitable bibliography is appended. The print, illustrations and get-up are all that could be desired.

P. N. R.

THE STOMACH AND DUODENUM.—By G. B. Eusterman, M.D., F.A.C.P., D. C. Balfour, M.B., M.D. (Tor.), LL.D., F.A.C.S., F.R.A.C.S., and Members of the Staff (The Mayo Clinic and the Mayo Foundation for Medical Education and Research, Graduate School, University of Minnesota). 1935. W. B. Saunders and Company, Philadelphia and London. Pp. xv plus 958, with 436 illustrations. Price, 45s.

This comprehensive volume is the combined work of Drs. Eusterman and Balfour, and some thirteen other contributors all of whom are on the staff of either the famous Mayo Clinic itself, or the Mayo Foundation for Medical Education and Research at the University of Minnesota.

The book is made especially interesting by the fact that as Dr. Eusterman is the head of the division of medicine and Dr. Balfour is the head of the division of surgery at the Mayo Clinic, both the medical and surgical aspects of diseases of the stomach and duodenum are intimately correlated and are at the same time placed before the reader.

This is a great advantage for though many purely surgical books and many purely medical books have been written on the stomach and duodenum, they are frequently biased and the authors often dogmatic on the aspect from which they write and sceptical of the other side of the question.

In this volume, however, each pathological entity is discussed impartially from the medical and surgical outlook, and the results of each method of treatment are carefully tabulated, the experience of the authors being represented by case histories and records.

The book begins with an extremely interesting history of the recognition and treatment of gastric and duodenal diseases, first from ancient times through the Renaissance, then through the seventeenth, eighteenth and nineteenth centuries to the present day, from which it can be noted that it was probably in the first 10 years of the present century that the greatest strides in the surgical treatment of peptic ulceration were made, notably by Moynihan and the Mayo brothers.

Then follow sections on the applied physiology and the surgical pathology, after which comes a long discussion on the description and treatment of gastric and duodenal ulceration.

This section is very well done, the authors paying particular attention to medical treatment in the first place, and stressing what is the generally accepted doctrine of the present day; that it must be complete, and surgical interference should not be adopted until it is obvious that medical treatment is not going to effect a cure. They recommend however that owing to the menace of carcinoma, and greater liability to perforation when the ulcer is situated in the stomach, that medical treatment of this condition should not be persisted in for so long a time as in duodenal ulceration, unless the patient responds well to the treatment from the first.

The accomplishment of surgery in benign lesions of the stomach and duodenum is rightly described as one of the triumphs of modern medicine, and all the operations such as gastro-enterostomy alone, or with excision

of the ulcer, pyloroplasty, partial and complete gastrectomy, etc., are most carefully and completely described, each being accompanied by a symposium of its pros and cons and what particular type of case which in the author's opinion it is most suitable for.

Gastric carcinoma, hypertrophic pyloric stenosis, paraduodenal hernia and all other lesions to be found in the stomach and duodenum are fully dealt with in their turn.

In the discussion on the treatment of gastritis and hyperacidity a welcome word of warning against the uncontrolled use of sodium bicarbonate is given.

No mention anywhere in the book is made of the use of histidine in the treatment of gastric and duodenal disease.

The volume is very well got up, is beautifully printed, and contains many excellent diagrams, x-ray photographs and tables.

H. E. M.

TUMOURS OF THE URINARY BLADDER.—By E. BEER, M.D., F.A.C.S. Baillière, Tindall and Cox, London. Pp. vii plus 166, with 58 illustrations including 8 in colour. Price, 16s.

This is a neat little monograph written only on tumour formations in the urinary bladder. It is the outcome of the experience of the author on the subject for a period extending over a quarter of a century, and the result of systemic observation of numerous cases which have been studied by a specialized 'team' in the surgical unit of the Mount Sinai Hospital, N. Y., under the able leadership of Dr. Beer.

The allotment of pages to the discussion of the various items has been done very carefully and economically, and no better introduction of the subject-matter could have been made than with a historical sketch. The few pages taken up by this will be appreciated by those who are interested in the evolution of the present-day knowledge of the subject.

The incidence, symptomatology, pathology and the methods of diagnosis have all received adequate considerations in the succeeding three chapters. The last 100 pages of the book have been devoted exclusively to an elaborate discussion of the treatment by various methods, with statistics of the results thereof. An outstanding feature of the book is the exhaustive bibliography at the end. It is a somewhat strange coincidence that the experience of the author over a quarter of a century has required a bibliography covering also about a quarter of the main book, i.e., 30 pages out of a total of 130!

The paper, printing and the illustrations, specially the coloured ones, are worthy of the excellent subject-matter as well as of the rather high price of 16/-. In conclusion, we are only too glad to admit our disappointment in having been unable to find any mistake in the book—a matter which the publishers can well be proud of.

M. N. D.

TONSILS AND NASO-PHARYNGEAL SEPSIS.—By E. A. Peters, M.D. (Cantab.), F.R.C.S. (Eng.). 1935. Baillière, Tindall and Cox, London. Pp. vii plus 92. Illustrated. Price, 5s.

MR. PETERS has succeeded in producing a very valuable little book on a time-worn and threadbare subject.

In the short space of 92 pages he proves that nasopharyngeal disease and early respiratory disease are associated in providing the portal for most infections of the present day. This is of course well known if not generally admitted; but the author proves his thesis so convincingly that it would be a good thing if this little book were in the hands of all general practitioners and all doctors responsible for the health of school children.

As the author points out, tuberculous glands of the neck were very common indeed in the past, but the removal of infected tonsils in addition to improved

hygiene has reduced the numbers of sufferers from this disease to nearly vanishing point. This alone is no small achievement.

If further justification were needed it will be supplied by the observant parent who reports improved vitality, temper, breathing and diminished catarrh in his child as the result of the removal of septic tonsils and adenoids.

The author gives a lot of very useful suggestions as to treatment of various throat conditions short of operation. I have not found gargles of any use in acute conditions, such as a quinsy. Hot alkaline antiseptic lotions applied with a Higginson's syringe or from a douche can be much more useful.

As regards operative treatment he says enucleation by dissection is the operation of choice in adults. My objection to this operation is that it needs such a deep anaesthesia. This does not matter if you have the services of a highly trained anaesthetist.

All children's tonsils can be cleanly enucleated with the reversal guillotine and 99 per cent of all adults' tonsils provided one has a manual dexterity of a little over the average and a lot of practice.

I repeat, it is a valuable little book.

H. S. C.

PROBLEMS IN FILARIASIS.—By T. Bhaskara Menon, M.D. (Mad.), M.R.C.P. (Lond.), Pathologist to the Government Royapuram Hospital, Madras, and Lecturer in Pathology, Stanley Medical School, Madras. Printed by Messrs. Thompson and Co., Ltd., Madras. 1935. Pp. iii plus 67. Illustrated. Price, Re. 1

AMONG the major tropical diseases the study of filariasis has not so far received sufficient attention notwithstanding the great prevalence of this infection in this country. Nearly eight years ago Sir Frank Powell Connor, Kt., pleaded for the appointment of a commission of eminent medical men for a thorough investigation of this infection. There are still a large number of problems in filariasis which have not been solved or which are imperfectly understood, and an extensive investigation of these problems is urgently needed. For instance, the treatment of the disease is a question which deserves immediate attention as no specific drug has so far been discovered. An intensive search is necessary for this purpose and the co-operation of a number of workers may be required in this connection.

The book under review has for its object the focussing of the attention of the medical profession in India on various important problems in filariasis and is thus a welcome addition to the existing literature on the subject. The book is a collection of three lectures forming the Maharaja of Travancore Curzon lectures delivered before the University of Madras. Need for further investigations in this 'much neglected' infection is forcibly brought out in his valuable foreword to the book by Sir Frank Powell Connor, Kt., D.S.O., K.H.S., F.R.C.S., I.M.S., Surgeon-General with the Government of Madras, who writes:—'Filariasis still remains in South India, and in many other parts of the world, as a vast unsolved problem causing misery and disability to millions of human beings. This does not mean that we know little or nothing about this affection, for we know a great deal; but much more has yet to be discovered before the problem can be said to be mastered'.

In the first lecture Dr. Bhaskara Menon deals with the epidemiological problem and that of clinical types. The author points out that while the prevalence of filariasis along the coast line districts and along the banks of rivers is capable of explanation a puzzling feature has been the peculiar distribution of the infection in endemic areas. 'Small circumscribed foci are met with where the infection rate is very high, but neighbouring areas with very similar climatic conditions show only a lower incidence'. The results obtained by various investigators in this connection are summarized. The author seems to revert to the old

theory of Manson (1898)—which Manson himself discarded in his Lane lectures (1905)—that the infection is transmitted through water containing the infective larvæ. While no doubt the problem was not clearly understood till recently, systematic work carried out at the Calcutta School of Tropical Medicine has explained this peculiar distribution of the infection and it is now clear that the distribution of the infection primarily depends upon three factors, *viz.* (1) density of mosquito population, (2) density of human population, and (3) optimum conditions of temperature and humidity. It is thus possible to understand the low incidence of the infection in an area which adjoins a highly endemic centre, *e.g.*, Ernakulam and Cochin. Even in the same town the infection is not uniform. For instance, in Cuttack the microfilaria rate is very much higher in the central wards of the town than those on the outskirts. This feature is typical of *Wuchereria bancrofti* infection which is the most common parasite in India. The prevalence of filariasis in cities like Calcutta with good pipe water supply, and especially among the European population, shows definitely that the infection could not be explained as due to the use of water with infective larvæ. On the other hand a consideration of the factors mentioned above, such as density of mosquito population and density of human population, can successfully explain this peculiar distribution.

Another problem requiring explanation is the variation in clinical types met with in different localities. The author raises the question whether this difference may be due to the infective larvæ invading the skin in different areas in differing localities and states that it is difficult to imagine how the genital lesions can be caused unless we presume that the infection is water borne. If this theory is accepted it would be equally difficult to explain the presence of genital lesions among Europeans in cities like Calcutta. A more satisfactory explanation is the one offered by Acton and Rao who state that the difference in the clinical types is dependent upon the intensity of the infection in an area.

Lecture II deals with the problem of microfilarial periodicity. The explanation offered by Clayton Lane and the results obtained by various investigators are discussed in detail, as well as the objections raised against Lane's theory by Low and Manson-Bahr. The author appears to favour the theory of cyclical parturition during the day put forward by Lane, but rightly points out that further research work is necessary in this connection to support either view. The latter part of the lecture deals with pathological problems and contains a valuable summary of the investigations carried out by different workers. In this section the author gives an account of his own work and reproduces a number of photomicrographs obtained by him.

In the last lecture, Dr. Menon discusses the pathology of elephantiasis, methods of diagnosis, and treatment. A useful survey of these subjects is given. A valuable feature of this section consists in the account of the author's own researches on some of these problems, especially the radiosopic method of diagnosis. Five radiograms showing the opacities of calcified worms in elephantoid tissue, in the wall of a hydrocele sac, and in lymphangitis of the arm are given. As regards treatment, the author shows that inorganic and organic compounds of antimony, organic arsenicals and gold therapy tried so far have been disappointing and that anti-streptococcal vaccines are very popular with the profession in India. The newer method of treatment described by O'Connor of injecting sulpharsphenamine directly into the abode of the parasite has been tried with success. The difficulty with this method of treatment is the location of the worms although radiography might give a valuable clue. The lecture concludes with a forcible appeal for need for further work in filariasis.

S. S. R.

ANTENATAL AND POSTNATAL CARE.—By F. J. Browne, M.D. (Aberd.), D.Sc., F.R.C.S. (Edin.), F.C.O.G. 1935. J. and A. Churchill, Limited, London. Pp. xv plus 480, with 58 illustrations. Price, 15s.

Antenatal and Postnatal Care is a book that can be recommended with confidence to students and doctors who undertake the care, supervision and treatment of expectant mothers. Conscientious application of the practical instruction contained in the book will do much to rescue antenatal care from the disrepute into which it has fallen by being inadequately and perfunctorily practised. At the same time the book indicates gaps in our knowledge, and will, if it is studied and its lessons applied, increase the interest of the antenatal clinic by stimulating investigation and experimental treatment.

The physical ills from which the antenatal mother suffers in western countries are very fully dealt with and Dr. Grantly Dick Read has contributed an interesting chapter on the influence of the emotions upon pregnancy and parturition. One chapter is devoted to the anæmias of pregnancy, but osteomalacia and tetany receive only brief treatment, and the diarrhoeas and tropical diseases which complicate pregnancy and the puerperium in the East are not mentioned.

Only eleven out of the 430 pages of text are allotted to the organization and administration of antenatal and postnatal clinics. The omission is to some extent compensated by the inclusion as an appendix of the recommendations printed in the *Interim Report of the Departmental Committee on Maternal Mortality* on the conduct and scope of antenatal clinics. The best site for the clinic, its relationship to the midwife and public health services, these and other administrative problems are largely neglected by clinical workers, yet they merit greater attention and are of sufficient importance to warrant inclusion in future editions.

Antenatal care is a subject of growing importance; the literature is limited and Professor Browne's contribution is an important review of present knowledge and practice. The expert will find the bibliography valuable, and the book itself will have a wide sphere of usefulness amongst doctors practising obstetrics.

J. M. O.

MEDICAL RESEARCH COUNCIL. THE PATHOGENIC AEROBIC ORGANISMS OF THE ACTINOMYCETES GROUP.—By Dagny Erikson. Special Report Series No. 203. Published by His Majesty's Stationery Office, London. Pp. 61. Illustrated. Price, 1s. 6d.

'THIS report deals with a systematic study of infective micro-organisms belonging to a group which lies on the border line between the true fungi and the bacteria which multiply by fission. It is the result of work done by Miss Dagny Erikson in the National Collection of Type Cultures, maintained by the Medical Research Council at the Lister Institute, London.

Real advance in the study of fungi of medical importance has for long been hindered, as professional mycologists have often remarked, by inadequate examination and description of strains recovered from various human and animal sources, and by a confused and irresponsible nomenclature which has greatly embarrassed the archives of the subject. Accurate comparative investigation of pathogenic strains by modern methods, moreover, has been impeded through cultures described and docketed in the literature being allowed to die out. It was one of the chief objectives of the Council, in founding the National Collection in this country, to improve this state of affairs by soliciting the deposition there of inadequately identified strains which could be retained in the living state for comparative study when occasion arose'.

'For general classification Miss Erikson has found Orskov's morphological scheme most convenient, and she has succeeded in identifying by their cultural, morphological and biochemical properties no fewer than

twenty-five species, including fifteen that appear to be entirely new. Her report is fully illustrated by many plates accompanying the text, and the Bacteriology Committee of the Council have recommended its publication in the hope that it will form a useful basis for future work aimed at the analysis, on serological lines, of possible antigenic affinities between different members of this highly polymorphic and difficult group of pathogenic organisms.

A MANUAL OF PRACTICAL CHEMISTRY FOR PUBLIC HEALTH STUDENTS.—By A. W. Stewart, D.Sc., A.I.C. Third Edition. 1935. John Bale, Sons and Danielsson, Limited, London. Pp. xiv plus 121. Illustrated. Price, 7s. 6d.

This manual is designed to supply the necessary practical chemistry exercises for D.P.H. students. It is divided into parts dealing with (i) acidimetry and alkalimetry, (ii) air analysis, (iii) water analysis, (iv) analysis of foods and beverages, and (v) disinfectants and preservatives. At the end of these sections there are a few pages devoted to a summary of the more important British Ministry of Health and other reports of chemical interest. The whole text is interleaved with blank pages to enable the students to record their experiments and make necessary notes. There are several diagrams to illustrate the apparatus used and two of these illustrate some water organisms. The notes explaining the object of an experiment, the description of the process, the reactions involved and the standards in use are very concise and clear. The book is not intended to replace the standard textbooks on public health chemistry, but can be safely recommended for the use of public health students and workers in public health laboratories.

S. G.

BODY WATER: THE EXCHANGE OF FLUIDS IN MAN.—By John P. Peters, M.D. 1935. Baillière, Tindall and Cox, London. Pp. ix plus 405. Price, 18s.

DR. JOHN P. PETERS for many years has been working on the distribution and movements of solutes and water in the human body, and the present volume gives a brief summary of these investigations, as well as a review of the whole subject of fluid exchanges in the body.

The first eight chapters deal with exchange of fluid and the chemical forces which control them, the nature and movements of interstitial fluid and lymph, exchanges between blood and interstitial fluids, serous fluids and transudates, exchanges between blood cells and serum, exchanges between tissue cells and interstitial fluids, water oxidation and losses through skin and

respiratory passages, and exchanges in the gastrointestinal tract. The last four chapters deal exhaustively with the nature of renal activity and mechanism of excretion of urine. This is not surprising, as the author in the preface states that the initial stimulus for this work comes from a desire to elucidate the phenomena seen in nephritis.

The book gives a very clear and lucid exposition of a very difficult subject such as only a worker like Dr. Peters could produce; it will be welcomed by those interested in the question of fluid exchange in the body. At the end of the book there is an extensive bibliography comprising of 875 references.

R. N. C.

ACTINOTHERAPY TECHNIQUE: AN OUTLINE OF INDICATIONS AND METHODS FOR THE USE OF MODERN LIGHT THERAPY.—With Foreword by Sir Henry Gauvain, M.D., M.Chir. (Camb.), F.R.C.S. (Eng.). Third Edition. 1935. Published by the Sollux Publishing Company, Slough. Pp. 190.

This small book is published by the Sollux Publishing Company. Since its first appearance in 1933 it has been twice revised making it an annual publication.

Part I comprising fifty pages is devoted to an outline of the physical data of actinic rays, their physiological effects and the dosage.

Part II is devoted to treatment of diseases arranged alphabetically. The descriptions of appropriate treatment are very briefly given but under each disease are included references to the literature. The references which number 1,082 are given serial numbers so that needless repetition is avoided, for the reference is given in full in the first instance in which it is quoted and on subsequent occasions the number only need be given. This book will be found of use mainly as an up-to-date bibliography for practitioners employing this form of treatment rather than a textbook of the subject.

FELLOWSHIP EXAMINATION PAPERS FOR THE DIPLOMAS OF THE ROYAL COLLEGE OF SURGEONS, EDINBURGH, 1931-35. E. and S. Livingstone, Edinburgh. Pp. 44. Price, 2s. 6d. net; postage, 2d.

FELLOWSHIP examination papers are always useful and interesting to teachers of surgery and also to post-graduate students going up for higher studies. The present volume contains the examination papers of the Edinburgh fellowship for the years 1931-35. Now that an increasing number of Indian students are going up for higher qualifications in surgery, the present volume may be recommended to their notice. It is a handy little volume and the printing and get-up are excellent.

P. N. R.

Abstracts from Reports

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1933. VOLUME I. ON THE STATE OF THE PUBLIC HEALTH IN BRITISH INDIA AND SOME INDIAN STATES

[Continued from last issue, p. 58]

Malaria.—The relationship of the incidence of malaria with rice cultivation was alluded to in my report for 1931. Since then, the breeding of anopheles in relation to rice cultivation has been investigated in Lower Bengal by Mr. Purnendu Sen, Entomologist, Public Health Department, Bengal. In his introductory remarks Mr. Sen says:—

'There has been a tendency during recent years among certain malariologists to associate the paddy

fields in the proximity of human habitations with the malariousness of a place. That is to say, the rice fields have been considered by many as the chief source of anopheline output in a locality, the water accumulating in these fields furnishing the necessary breeding surfaces for these mosquitoes. The suspicion has naturally induced certain municipalities and other corporate bodies responsible for public health to prohibit wet cultivation within a mile or a half of their jurisdiction.'

'Rice being the staple food of this province, this prohibition might cause great distress to the people and the matter, therefore, deserves serious consideration from the public health authorities of the country. The mere presence of rice swamps might not be sufficient to indicate that the place would be malarious. As one can understand this would greatly depend on the extent to which the cultivation is found to afford

breeding facilities to those anophelines which are known to transmit malaria'.

'But unfortunately we are not fully aware what exact rôle is being played by the rice swamps under normal circumstances on the life and distribution of these carrier species of anophelines. Wide divergence of opinion on this point exists amongst different workers, some claiming their complete dissociation in the causation of malaria while others consider the rice fields as the main source of trouble'.

The investigation covered a period of two years, from October 1932 to September 1934. His important conclusions are reproduced below:—

'The intensity of anopheline breeding in the paddy fields of Bengal villages varies in different localities. It is not always that the amount of breeding in these fields is greater than the breeding of anophelines in other types of water collections in the villages'.

'The breeding in the paddy fields commences in July and ends in January following. The maximum breeding, however, takes place in September'.

'The presence of paddy fields in the vicinity of villages does not always signify that the place will be malarious, nor do the paddy fields always breed carrier species of anopheles'.

'The species noted from the different paddy fields are—*A. hyrcanus* var. *nigerrimus*, *A. barbirostris*, *A. subpictus*, *A. vagus*, *A. varuna*, *A. aconitus*, *A. ramsayi*, *A. annularis*, *A. philippinensis*, *A. pallidus* and *A. tessellatus*. Of these *A. varuna*, *A. annularis* and *A. philippinensis* have been reported to be infected in nature in Bengal'.

'The species, *A. pallidus* and *A. tessellatus*, occur only very rarely, and *A. hyrcanus* var. *nigerrimus* comprises nearly 50 per cent of the total catch'.

Quinine.—Details of the amounts of quinine and cinchona febrifuge issued in districts in each province make it clear that in no area are adequate amounts of the drug available.

Botanical survey of India.—At the close of 1933-34 the total Government of India stock of quinine sulphate purchased as such and extracted from Java and Burma barks amounted to 267,657 lbs. as against 282,759 lbs. in 1932-33.

Government cinchona plantations and factory in Bengal.—A total of 1,131,960 lbs. of bark was harvested whilst 1,659,090 lbs. were available from the previous year. Altogether 1,436,796 lbs. were utilized in the factory of which 1,268,365 lbs. belonged to the Bengal Government and the balance to the Government of India. The products obtained were 51,094 lbs. of quinine sulphate, including 3,085 lbs. in process, and 28,523 lbs. of cinchona febrifuge, the distribution according to the sources being—

	Quinine sulphate, lbs.	Cinchona febrifuge, lbs.
Munseong bark	37,309	20,508
Mungpoo "	8,419	4,621
Burma "	2,805	2,367
Java "	2,561	1,027
TOTAL	51,094	28,523

The total cost of the bark was Rs. 4.72 per lb. and that of extraction of quinine was Rs. 2.721 per lb. Thus the production of quinine has cost Government Rs. 7.441 per lb.

Madras Government cinchona department.—A total of 22,716 lbs. of quinine sulphate was produced, including quinine sulphate and tablets 20,999 lbs., quinine hydrochloride 1,348 lbs., quinine dihydrochloride 588 lbs., cinchona febrifuge 13,141 lbs. and totaquina 2,124 lbs.

Dysentery and diarrhoea.—These diseases were responsible for a higher mortality than in the previous year in Madras, Delhi, Bengal and Ajmer-Merwara. Of the total, 127,666 deaths were among males and 118,498 among females; 199,161 deaths were registered in rural and 47,003 in urban areas and the urban death

rate exceeded the rural in every province. As usual the third quarter, which corresponds with the monsoon period, recorded the highest number of deaths.

Tuberculosis.—The recorded statistics available from seven provinces show that tuberculosis is mainly an urban disease. Whilst two per cent of the recorded deaths from all causes are due to tuberculosis of the lungs, nearly 5 per cent were registered in urban and only about 1 per cent in rural areas. This however is certainly an underestimate as in Delhi municipality, for example, where registration is more accurate, the number of deaths ascribed to phthisis was found on verification to be 850 in 1933 or nearly twice the figure actually reported by the ordinary agency. In urban areas where registration is less accurate, this difference is likely to be even greater, whilst in rural areas the situation is still worse. Tuberculosis is now almost certainly one of the main public health problems in India, ranking probably next to malaria in this respect. In fact, it may be regarded as an epidemic disease. Most western countries are said to have already passed through the epidemic stage, the peak of the epidemic in England was reached as far back as 1820, but it is difficult to state exactly at what stage the disease now is in India. Some hold that the peak has not yet been reached; that India is still in the early stages; and that the extent of tuberculization of the population in India to-day is midway between that of the African races and the highly industrialized and urbanized European races. This view may or may not be correct but the fact remains that the disease is rampant. If one lays stress on the results obtained by the tuberculin test, the infection rate would seem to vary between 21 and 76 per cent according to the density of population, giving an average of 46 per cent. The bad housing conditions, the congestion and overcrowding, the unhygienic habits and customs of the people and the increasing urbanization and industrialization are without doubt conditions which predispose to rapid spread of infection, but the increasing interest in the disease, the earlier detection of cases and improved registration must be partly responsible for the increased figures. Social conditions, however, are pre-eminently suitable for spread of infection and the solution of the problem lies deep-rooted in the habits and customs of the people. No anti-tuberculosis campaign can hope to attain success if this fact is not constantly kept in mind.

The figures do not confirm the view held by some that tuberculosis presents a more serious problem in rural areas than in the towns. Whilst it is probable that tuberculosis infection is more common in the ordinary village than available statistics would indicate, anyone acquainted with rural life in India knows that, although sanitation is primitive and housing is of a low standard, men, women and children all live an active outdoor life and do not suffer from the overcrowding and ill-ventilation which is so common a feature in Indian cities and towns. These facts alone would go to indicate that tuberculosis infections cannot be anything like as ubiquitous in the rural areas as they are in the towns and there seems little reason to think otherwise. No doubt, the industrial workers of the cities are drawn from the village populations and those workers who fall victims to tuberculosis return to their villages when they find themselves no longer able to work, so that in certain areas from which industrial recruits are drawn there may be considerable numbers of active tuberculosis cases but this applies to very small parts of rural India and can have on the whole little influence on the tuberculosis rate in the general rural population of the country.

Notification of disease is an essential preliminary to any constructive measures for prevention and treatment and it is regrettable that little or no progress can be reported in this respect. In England and Wales as far back as 1907 the Local Government Board encouraged the voluntary notification of cases of pulmonary tuberculosis; in 1912 it was made compulsory. The position in India is one of marked contrast to

of the hot weather, *i.e.*, in the months of March, April and May.

Even modern medicine seems to be able to do little for the prevention and treatment of this serious disease. The Government of India Central Research Institute at Kasauli has prepared and issued an anti-meningococcic vaccine manufactured from cultures originally taken from cases in Delhi and this product is now under trial in selected communities, such as jails, schools and other institutions of the kind. Similar efforts have been made by the Director of the Haffkine Institute, Bombay, who has isolated strains of the meningococcus from cases at Ahmedabad. It is not so far possible to indicate the results obtained with these vaccines, and although the experts of the Ministry of Health in England are inclined to think that they may be of value, it is still premature to hazard any definite opinion.

Anti-meningococcic serum has not hitherto been manufactured in India, but English supplies have been imported and stocked for the needs of the Army and for civil purposes on emergency indents. The preparation of anti-meningococcic serum in India will depend largely on the results of the tests now under experiment, but it is proposed to make the attempt as soon as the 'type' question has been settled. This seems more than desirable because the results which have so far been obtained in India with English serum have not been entirely satisfactory.

[This abstract will be concluded in our next issue.]

REPORT ON THE SESSION OF THE OFFICE
INTERNATIONAL D'HYGIENE PUBLIQUE
HELD IN PARIS, 29TH APRIL TO 8TH MAY,
1935. BY LIEUT.-COL. G. G. JOLLY, C.I.E.,
V.H.S., M.B., D.P.H., D.T.M., I.M.S., DEPUTY
DIRECTOR-GENERAL, INDIAN MEDICAL
SERVICE, DELEGATE FOR THE GOVERN-
MENT OF INDIA

INFORMATION ON YELLOW FEVER RECEIVED DURING THE
SIX MONTHS ENDING 31ST MARCH, 1935

Notified cases of yellow fever.—During the last quarter of 1934 and the first quarter of 1935, Africa, Brazil and Columbia were only countries from which notifications of cases and deaths from yellow fever were received by the Office International d'Hygiene Publique.

Protection test results.—During the period under review the mouse-protection test has fully maintained its reputation as a reliable method of ascertaining the occurrence of yellow fever in the past. Some interesting results have been obtained by the application of the test in places which used to suffer frequently from epidemics but have been free from clinical cases for 20 or more years. For example the blood of 12 out of 16 Cubans who were born before 1901 (which was the year of the last great yellow fever epidemic in that island) contained protective immune bodies while no person among 14 who were born after 1908 (which year the disease had been completely eradicated) possessed any immunity. The same complete absence of immune bodies in the blood of persons aged 20 years and under was found as a result of examining the blood of 72 persons born in the island of Barbados. The test has also been of great assistance in investigations at Guayaquil and elsewhere in deciding whether patients whose illness was provisionally diagnosed as yellow fever had really suffered from this disease or not. The fact that the blood of these persons after recovery from the illness contained no yellow fever immune bodies, and that the results of protection tests made on a large number of children in neighbouring localities were uniformly negative, indicated that probably Guayaquil and other ports on the Pacific coast of America are free from yellow fever at the present time. In this connection an important pronouncement made by Dr. Soper at the Ninth Pan-American Sanitary Conference recently held at Buenos

Aires was that during the last five years yellow fever in epidemic form has not been present in any important port on the American continent, nor has any evidence of the international spread of yellow fever virus been obtained.

The application of 'viscerotomy'.—Viscerotomy is the operation by which, without making an autopsy and without mutilating the body, a specimen of liver tissue for histo-pathological study is extracted through a hole from 1 to 2 centimetres wide, made with a viscerotome in the costal area of the hepatic region. The operation is very quickly performed and, on withdrawing the cannula of the instrument, the hole in the skin closes of itself without it being necessary to join the edges with a stitch or to apply adhesive plaster.

The practice of viscerotomy has not yet been adopted widely in Africa but viscerotomes have recently been sent to Bathurst (Gambia), Freetown (Sierra Leone), Accra (Gold Coast) and to the Anglo-Egyptian Sudan, Kenya and Uganda. In other parts of Africa viscerotomy has not yet been practised, but in some areas, in French Equatorial Africa, partial autopsies are made in certain fatal cases and the specimens of liver tissue obtained at these autopsies are sent to the Pasteur Institute, Paris, for examination.

Vaccination against yellow fever.—In England the method of immunization against yellow fever by the inoculation of neurotropic virus and yellow fever immune serum is being continued. The number immunized in London by this method now amounts to 424. As a rule the yellow fever immune serum used is the heterologous serum of Pettit and Stefanopoulos in doses of 0.4 to 0.5 c.c.m. per kilogramme of body-weight, but for persons who are found (by a preliminary intradermal inoculation of 0.1 c.c.m. of the serum) to be highly serum-sensitive, human yellow fever immune serum is used. The chief disadvantage of the use of the heterologous serum is that occasionally severe urticaria and arthritis follow the inoculation. In addition to the protective inoculations done in England on persons proceeding to Africa and South America, 158 Europeans were immunized by the same method at Bathurst, Kerewan, Kuntaur, Georgetown and Basse in the Gambia during or shortly after the recent outbreak of yellow fever in that colony. During this outbreak the Laigret method of immunization, in which immune serum is not used, was also applied to some extent in Bathurst, and it is understood that practically every European resident in the Gambia can now be regarded as having been immunized against the disease. The result is very satisfactory because the Gambia is a colony in which natural conditions and other factors make it very difficult to take effective anti-mosquito and other measures for reducing permanently the endemicity of yellow fever and preventing its spread.

NOTE ON YELLOW FEVER INVESTIGATIONS IN THE
ANGLO-EGYPTIAN SUDAN

Routine histological examinations of livers from all suspected cases have been carried out and although no cases of yellow fever have been diagnosed clinically since last June any sections considered in the least suspicious were submitted to Dr. Findlay for his opinion.

Of seven sections sent he reported five as not yellow fever and two were considered suspicious. One case was from a western immigrant in Wad Medani with a clinical history of jaundice, seven days' fever, coma, death. The other section was also from a western immigrant—a cattle man—admitted moribund to El Obeid hospital with deep jaundice and fever. Some areas of the liver were suspicious but in the absence of clinical details and examination of other organs it was 'not possible to be certain'.

Of the two cases the one from Wad Medani gave a negative protection test while it was impossible to obtain serum from the other.

Only one case was considered even clinically suspicious by the local medical authorities. This was from

that in England. So far there is no Ministry of Health as such; there is no Central Board of Health; and there is no general Public Health Act under which tuberculosis and other regulations might be framed.

Since public health and disease prevention are 'transferred' subjects, no one general policy is followed in India in regard to the prevention of tuberculosis. The Public Health Commissioner with the Government of India has neither direct nor indirect control and the different provinces plan independently where they plan at all. The only All-India Organization solely concerned with anti-tuberculosis work in India is the King George's Thanksgiving (anti-tuberculosis) Fund. This organization is ill-equipped financially and for this reason confines its activities mainly to propaganda work. The provincial municipal and other Acts do not include provisions for anti-tuberculosis work and will have to be amended before they can be made applicable; the position as regards rural areas is even worse.

Beri-beri.—The figures do not give any accurate estimation of the true incidence of the disease in the general population, but even so they once more differentiate clearly the main rice-growing provinces from those where rice is not the staple article of diet.

[Epidemic dropsy and beri-beri do not appear to be differentiated in this report, as the former disease is not mentioned.]

Ankylostomiasis.—Much the highest number was as usual recorded in the Madras Presidency.

Leprosy.—The high rates recorded in Madras are a measure of the anti-leprosy campaign's activities in this province.

Kala-azar.—In the concluding paragraphs of a paper by Drs. L. E. Napier and K. V. Krishnan the position is summarized in these words:—

'It is thus apparent that in Madras the disease is truly endemic and not subject to much variation from year to year; in Assam it is epidemic and disappears almost entirely from many places in the inter-epidemic period; in Bengal the state of affairs is intermediate between these two extremes, it is endemic, more or less throughout the province, but is subject to periodic increases of incidence. Or to refer to the disease of a population as one would the disease of an individual—in Madras it is chronic, in Bengal sub-acute with periodic exacerbations, and in Assam it is acute with periodic relapses'.

'When the disease is invading virgin soil, the mass immunity is low, the infection is easily established, and the disease is epidemic; the clinical disease—the evidence of the fight between the parasite and host—is acute, there is little scope for host-parasite adjustment, and the result is a decisive victory on one side or the other. This was the state of affairs in the early Assam epidemics; history relates that 95 per cent of patients died, the rest being completely cured. Amongst so small a number of surviving hosts, there would be a negligible number, if any, of examples of imperfect immunity response'.

'With an increase in mass immunity in the population, which inevitably follows the subjection of a population to repeated epidemics, the disease will become endemic, it will assume a less acute symptomatology—the host-parasite battle will be less severe; there will be more scope for host-parasite adjustment, there will be a greater number of surviving hosts, and the examples of imperfect immunity response will begin to appear. This is the state of affairs that existed in Bengal up to about 15 years ago'.

'With the further increase in mass immunity the chronic forms of the visceral disease appear, there are still more survivors and amongst these a greater number show evidence of imperfect immunity response, i.e., dermal lesions; this is the state of affairs which we believe exists in some rural endemic areas in Southern India to-day'.

'Our conclusion is that in Southern India are the oldest foci of kala-azar as far as India is concerned, that here the disease has passed through the two stages

now seen to exist in Assam and Bengal, respectively, and has reached a "chronic" stage where there is no rise and fall in incidence from year to year and the disease is truly endemic, and that the transmission is almost entirely from dermal infections, so that treatment of kala-azar cases alone does not affect the general incidence of the disease'.

Relapsing fever.—True relapsing fever is not common in India. It has been pointed out that the large numbers recorded in Bengal are not true relapsing fever; most of the so-called cases are probably due to malaria or other fevers in which relapses are a common feature. In an attempt to correct this error in registration it has been suggested to provincial public health departments that the word 'spirochætal' should be inserted after the word 'relapsing fever'. It remains to be seen if this will be sufficient to indicate to medical officers and others that relapsing fever is a definite disease.

Cerebro-spinal meningitis.—In a public health memorandum issued in 1932, the gradual spread of epidemic cerebro-spinal meningitis to the East was discussed and all available information as to the incidence of the disease in India was given in a series of tables. In 1932 figures showed that although cerebro-spinal meningitis had occurred in sporadic fashion in a number of towns and districts, there was little evidence that it existed anywhere in epidemic form.

An examination of available records, however, indicates that cerebro-spinal meningitis has certainly been known in India for over half a century.

The most notable epidemics in recent times have been that of 1931 in the Shikarpur special jail in Sind (Bombay Presidency); that of 1932-33 in the Lahore Borstal Institution, Punjab; the 1933-34 epidemic in Ahmedabad town in the Bombay Presidency; and that of 1933-34 in Delhi city. In the first of these, the infection appears to have been introduced from Upper Sind, a so-called endemic area. Despite precautions, sporadic cases occurred between April and December 1931, and the mortality was high, as 12 of the 13 recorded cases died. During 1932, 7 further cases with 4 deaths occurred, these being evidence of the difficulty of freeing an institution of infection once it is introduced.

Other outbreaks occurred during 1932, but except for that in Calcutta, no accurate figures can be quoted. In Nagpur, in the Central Provinces, for instance, 5 cases with 3 deaths were recorded. In Burma, a total of 14 deaths were registered in seven different urban areas, so that in this province infection seems to have been fairly widespread. In Calcutta, the cases numbered 145 and deaths 143. It is probable that in this city many cases remained undetected, as a cent per cent mortality rate is unusual, but there is little doubt that Calcutta was the centre of a serious outbreak.

During 1933, 142 cases with 68 deaths were recorded in Delhi city. Several of these cases were imported from outlying districts from which it is clear that by this time infection was widespread in rural areas. In the neighbouring city of New Delhi, also, 12 cases with 6 deaths were recorded, whilst in the Delhi jail 4 cases and 3 deaths occurred in 4 different gangs of prisoners.

Another sharp outbreak occurred in the Motihari jail in Bihar and Orissa during April 1933. Within three weeks, 11 cases with 6 deaths were recorded but after further 4 cases in May the infection disappeared.

During the whole of 1933, the disease continued in the city of Calcutta and no fewer than 387 cases and 348 deaths were recorded. Isolated cases were also reported from a few other places such as Chittagong and Baranaghat towns. In the Punjab, whilst no further outbreaks occurred in the Borstal Institution, a number of sporadic cases were recorded in Lahore city.

As regards periodicity, generally speaking, the incidence gradually increases to its peak at the beginning

of the hot weather, *i.e.*, in the months of March, April and May.

Even modern medicine seems to be able to do little for the prevention and treatment of this serious disease. The Government of India Central Research Institute at Kasauli has prepared and issued an anti-meningococcic vaccine manufactured from cultures originally taken from cases in Delhi and this product is now under trial in selected communities, such as jails, schools and other institutions of the kind. Similar efforts have been made by the Director of the Haffkine Institute, Bombay, who has isolated strains of the meningococcus from cases at Ahmedabad. It is not so far possible to indicate the results obtained with these vaccines, and although the experts of the Ministry of Health in England are inclined to think that they may be of value, it is still premature to hazard any definite opinion.

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INFORMATION ON YELLOW FEVER RECEIVED DURING THE SIX MONTHS ENDING 31ST MARCH, 1935

Notified cases of yellow fever.—During the last quarter of 1934 and the first quarter of 1935, Africa, Brazil and Columbia were only countries from which notifications of cases and deaths from yellow fever were received by the Office International d'Hygiene Publique.

Protection test results.—During the period under review the mouse-protection test has fully maintained its reputation as a reliable method of ascertaining the occurrence of yellow fever in the past. Some interesting results have been obtained by the application of the test in places which used to suffer frequently from epidemics but have been free from clinical cases for 20 or more years. For example the blood of 12 out of 16 Cubans who were born before 1901 (which was the year of the last great yellow fever epidemic in that island) contained protective immune bodies while no person among 14 who were born after 1908 (which year the disease had been completely eradicated) possessed any immunity. The same complete absence of immune bodies in the blood of persons aged 20 years and under was found as a result of examining the blood of 72 persons born in the island of Barbados. The test has also been of great assistance in investigations at Guayaquil and elsewhere in deciding whether patients whose illness was provisionally diagnosed as yellow fever had really suffered from this disease or not. The fact that the blood of these persons after recovery from the illness contained no yellow fever immune bodies, and that the results of protection tests made on a large number of children in neighbouring localities were uniformly negative, indicated that probably Guayaquil and other ports on the Pacific coast of America are free from yellow fever at the present time. In this connection an important pronouncement made by Dr. Soper at the Ninth Pan-American Sanitary Conference recently held at Buenos

Aires was that during the last five years yellow fever in epidemic form has not been present in any important port on the American continent, nor has any evidence of the international spread of yellow fever virus been obtained.

The application of 'viscerotomy'.—Viscerotomy is the operation by which, without making an autopsy and without mutilating the body, a specimen of liver tissue for histo-pathological study is extracted through a hole from 1 to 2 centimetres wide, made with a viscerotome in the costal area of the hepatic region. The operation is very quickly performed and, on withdrawing the cannula of the instrument, the hole in the skin closes of itself without it being necessary to join the edges with a stitch or to apply adhesive plaster.

The practice of viscerotomy has not yet been adopted widely in Africa but viscerotomies have recently been sent to Bathurst (Gambia), Freetown (Sierra Leone), Accra (Gold Coast) and to the Anglo-Egyptian Sudan, Kenya and Uganda. In other parts of Africa viscerotomy has not yet been practised, but in some areas, in French Equatorial Africa, partial autopsies are made in certain fatal cases and the specimens of liver tissue obtained at these autopsies are sent to the Pasteur Institute, Paris, for examination.

Vaccination against yellow fever.—In England the method of immunization against yellow fever by the inoculation of neurotropic virus and yellow fever immune serum is being continued. The number immunized in London by this method now amounts to 424. As a rule the yellow fever immune serum used is the heterologous serum of Pettit and Stefanopoulo in doses of 0.4 to 0.5 c.c.m. per kilogramme of body-weight, but for persons who are found (by a preliminary intradermal inoculation of 0.1 c.c.m. of the serum) to be highly serum-sensitive, human yellow fever immune serum is used. The chief disadvantage of the use of the heterologous serum is that occasionally severe urticaria and arthritis follow the inoculation. In addition to the protective inoculations done in England on persons proceeding to Africa and South America, 158 Europeans were immunized by the same method at Bathurst, Kerewan, Kuntaur, Georgetown and Basse in the Gambia during or shortly after the recent outbreak of yellow fever in that colony. During this outbreak the Laigret method of immunization, in which immune serum is not used, was also applied to some extent in Bathurst, and it is understood that practically every European resident in the Gambia can now be regarded as having been immunized against the disease. The result is very satisfactory because the Gambia is a colony in which natural conditions and other factors make it very difficult to take effective anti-mosquito and other measures for reducing permanently the endemicity of yellow fever and preventing its spread.

NOTE ON YELLOW FEVER INVESTIGATIONS IN THE ANGLO-EGYPTIAN SUDAN

Routine histological examinations of livers from all suspected cases have been carried out and a number of cases of yellow fever have been identified since last June any sections considered in the least suspicious were submitted to Dr. Findlay for his opinion.

Of seven sections sent he reported five as not yellow fever and two were considered suspicious. One case was from a western immigrant in Wad Medani with a clinical history of jaundice, seven days' fever, coma, death. The other section was also from a western immigrant—a cattle man—admitted moribund to El Obeid hospital with deep jaundice and fever. Some areas of the liver were suspicious but in the absence of clinical details and examination of other organs it was 'not possible to be certain'.

Of the two cases the one from Wad Medani gave a negative protection test while it was impossible to obtain serum from the other.

Only one case was considered even clinically suspicious by the local medical authorities. This was from

Rumbek in the Bahr-El-Ghazal Province and showed deep jaundice, black vomit and melæna. There was, however, no fever during the 48 hours in hospital before death and there was a leucocytosis of 50,000. The liver section was negative.

Nine out of 43 sera from cases of jaundice gave positive protection tests, of these 8 were from districts in the Southern Sudan where the previous survey gave positive protection tests and the ninth was the immigrant from Wad Medani mentioned above. These results confirm the geographical distribution of the positive protection tests as shown by Dr. Hewer's survey.

Dr. de Vogel read a long and interesting paper giving the results of his historical investigations into the experience of a Sudanese battalion which was sent to Mexico in 1863 because its men were considered immune to yellow fever. He draws various deductions and in the course of the paper discusses the danger of the spread of the disease to India and the East. Because of certain provocative remarks, the paper was not well received, but it is a valuable contribution which might be worth translating.

LIEUT.-COL. JOLLY'S STATEMENT AT THE YELLOW FEVER COMMISSION

I have been much interested in Dr. de Vogel's paper because he has expressed in it a point of view which has not perhaps yet received the attention it deserves—the point of view of the countries now threatened with an invasion of yellow fever, either through an infected mosquito or an infective person.

The danger appears to us to draw nearer every day. With the establishment of the new air line from West Africa to Khartoum which it is proposed to inaugurate this year, India will be brought within one week of West Africa. The danger of infection of India by sea may not at the moment be so acute but it exists and once East Africa becomes infected, and this appears to us to be only a matter of time, it will become immediate.

We are not satisfied with the exclusion of the so-called silent areas from the provisions of the convention. We are not convinced that these silent areas do not contain active foci of the disease.

I have been impressed by Dr. Morgan's account of the viscerotome service in Brazil. It appears to be not only the newest but also the simplest and most economical method of locating the disease and of following its fluctuations from day to day. Until by the establishment of a viscerotome service the silent areas have been made to speak, they must remain under grave suspicion, and air traffic should be protected within their limits in the same manner as is prescribed for proved infected areas.

India's alarm at the danger of the introduction of yellow fever from Africa does not confine itself merely to a desire to see all reasonable steps taken at countries of export. She has carried out *Aedes* surveys in Rangoon and Bombay and has begun mosquito control in both these ports. She is also taking steps to render her main air-port of entry at Karachi mosquito-free.

I have here a copy of a resolution passed by the Twelfth Annual Conference of Research Workers of India which met at Calcutta in November 1934 and which while it does not carry the authority of the Government of India expresses the considered opinion of a large and representative body of medical men engaged in research and public health work in India. With your permission I shall read this resolution.

RESOLUTION NO. 15, PASSED BY THE TWELFTH CONFERENCE OF MEDICAL RESEARCH WORKERS, HELD AT CALCUTTA BETWEEN THE 26TH NOVEMBER AND 1ST DECEMBER, 1934

In light of the recent developments in connection with yellow fever in Africa including the occurrence of suspected cases of the disease in areas where positive mouse-protection tests had been obtained although no clinical cases had previously been recognized, this conference views with concern the opinion expressed by

the Yellow Fever Commission of the Office International at its May 1934 session that the establishment of anti-amaryl aerodromes and the application of the other requirements of Section II of the Aerial Sanitary Convention are not obligatory in regions where the only information available is that of positive mouse-protection tests.

In the absence of exact knowledge of the epidemiological significance of the so-called 'silent areas' and the potentialities which these areas may possess for the dissemination of yellow fever, this conference considers that the approval given by the Yellow Fever Commission of the Office International to the exemption of such areas from the application of the provisions of Article 38, Chapter II of the Aerial Sanitary Convention, entails a weakening of the chain of preventive measures. This conference further expresses the opinion that such areas should be considered as definite yellow fever areas for the purpose of the application of the provisions of the convention and that the full requirements of the Aerial Sanitary Convention (Chapter II, Section II) should be made immediately applicable to them.

This conference is of opinion that the Government of India should take drastic precautions against air traffic coming from the 'silent areas' where the administrative authorities of these areas have not established anti-amaryl aerodromes.

[We have only abstracted portions of this report which refer to yellow fever, especially in connection with the danger to India, but many interesting discussions also took place on other major epidemic diseases most of which are of interest to medical authorities in India. We are however unable to include these in this abstract on account of want of space.]

ANNUAL REPORT ON THE WORKING OF THE RANCHI INDIAN MENTAL HOSPITAL, KANKE, IN BIHAR AND ORISSA, FOR THE YEAR 1934

DURING the year under report the Ranchi Indian Mental Hospital continued to receive patients from the provinces of Bengal and Bihar and Orissa, as in the previous years.

The accommodation of the hospital remained the same, viz, 1,014 for males, 272 for females, total 1,286. The 50 emergency beds sanctioned by Government in 1929 to relieve overcrowding in the male section were in demand throughout the year. There was no overcrowding in the female section.

As reported in previous years, none of the expansion projects could be taken up during the year under review, owing to continued financial difficulties.

In theory the advantage of treatment in the early and hopeful stage is not disputed. It seems that we shall never be able to see early cases in this hospital for treatment in large numbers until such time as the public is sufficiently educated as to the advantages of early treatment in modern mental hospitals. No matter how much we may deplore it, a strong odium is still attached to mental disease, and the relations desire to keep secret the fact that anyone in their family is so affected. The problem of encouraging early treatment cannot be solved without securing the confidence of the patient and of his family and any measure which will conduce to this end is worthy of careful consideration. It will not be out of place to report below the words of His Majesty the King-Emperor, when opening the Shenley Mental Hospital in England on 31st May, 1934: 'I note with satisfaction that, in designing this hospital, you have paid special regard to the treatment of the mental illness in its early stages by the addition of a Reception Hospital which I look forward to seeing to-day'.

The death rate of this, the largest, has again been the lowest of all the mental hospitals of India.

The general health of patients has been good throughout the year under report; there has been no outbreak of any epidemic disease during the year.

The insanitary area within the male enclosure, referred to in my last annual report, has since been reclaimed at a cost of Rs. 1,180, and I have every reason to believe that the heavy incidence of malaria in the male enclosure will now be generally lessened.

Although a considerable amount of freedom was enjoyed by the patients I am happy to be able to record that there was no case of escape during the year under report.

Sulphur injections in mental disorders.—Eighty patients were given this treatment during the year with the following results:—

Stationary or no improvement.	Improved	Recovered
29	35	16

Hitherto we have tried this most useful therapy in 295 cases with the following gratifying results:—

Stationary or no improvement.	Improved	Recovered
114	120	51

The above table shows that we have effected 17.3 per cent recovery and 40.7 per cent improvement in our patients by this method and we feel more happy over these results as we were the first in India to experiment with sulphur injections.

[Other forms of modern treatment in mental disease were employed in appropriate cases and it is clear that the hospital is quite up to date. Occupational therapy and amusements also continue to play a large part in the conduct of this hospital.]

Correspondence

NON-PLAGUE RAT MORTALITY

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—As far as I am aware, it is generally thought that when rats die, daily, in great numbers, they are only plague-infected ones. This view is held, not only by the lay public, but also by several medical men.

In view of this idea, the following is interesting:—In February last, plague occurred in a village, 5 miles from Ratnagiri, with a number of attacks and some deaths. Some of the villagers seemed to have come into this town from this plague-infected village and, soon after, there began to be here a rat mortality, of about 8 to 10 rats a day. It was therefore presumed that the infection was brought from this village. A rat was sent to me for examination by the municipality. On examination, I found, it had enlarged glands in the neck and other post-mortem appearances indicative of its being a plague-infected one. A smear from the spleen showed, microscopically, several plague bacilli. I, therefore, declared it a plague-infected one. A few days after, some rats were sent to the Parel Laboratory and the report was that they were not plague-infected.

Rats continued to die for nearly a month, but no case of plague occurred. Subsequent to the first examination, I examined other rats and found them not to be those of plague. There were no enlarged glands and no other signs indicative of plague. I was sure, however, that the first one was plague-infected.

I now recount what happened the previous year in 1934. Rats began to die every day and my predecessor, I understand, declared them to be plague-infected. Some way or other, it was not credited by the public that they were plague-infected. This want of belief was fostered, presumably, by the following incident at Chiplun, a taluka of this district, a short time previously. At this place, rats were falling for about 2 months and were declared by the Parel Laboratory, not to be plague-infected. No case of plague occurred at Chiplun. In Ratnagiri, however, plague broke out very severely, with 92 attacks and 61 deaths and created greater havoc, inasmuch as the town had not been evacuated when the rats were falling and no inoculations done until later. I understand that the first report from Parel about rats sent there was negative and positive for those sent a second time. The number of inoculations done were 11,000, with no death amongst the inoculated. The following questions and ideas arise, which may be considered:—

1. Whether this disease, which seems harmless to man, can be transmitted from one rat to the other and thus make it an easy problem for rat destruction.

2. Whether this disease simultaneously, starts amongst rats, when plague is commencing among them,

but, before the latter can get a hold among them, the other wipes them off.

3. It may be mentioned that rats dying from this disease, die similarly to those of plague. They seem intoxicated and die towards places where water is stored.—Yours, etc.,

J. F. HENRIQUES, L.M. & S.,
F.C.P. & S., B.M.S.,
Civil Surgeon.

RATNAGIRI,
25th November, 1935.

TRAINING IN PHARMACY IN INDIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—With great pleasure I read the speech recently delivered by Colonel Chopra in the Rotary Club, Calcutta.

I intend to say a few words in this connection. All-Bengal-Compounders Association was changed into 'Bengal Pharmaceutical Association' in 1934 under the presidency of Colonel Chopra whose object is to build up the profession of pharmacy on a scientific and ethical basis, and to protect the public from the grave danger to which it is constantly exposed due to the scandalous way in which the drug trade is carried on in the country. In all other civilized countries in the world, the drug trade and the profession are controlled by laws. But unfortunately in India, the profession of pharmacy is practically ignored and the compounders who represent the profession are in a horrible condition. No systematic training is given to them throughout the whole country and above all there is total absence of laws to control their qualification. The training imparted to them is so very inadequate that they become wholly unequal to discharging their responsible duties. In other countries their professional brethren are thoroughly conversant with the science of pharmacy and are only engaged for their particular work, but in India the compounders are not only employed for dispensing medicines but they also have to perform the duties of dressers, operation assistants, anaesthetists, nurses, etc. The chaotic condition of the compounders, who are even unjustifiably designated as compounders instead of pharmacists, or chemists and druggists, is fully discussed in the Report of the Drugs Enquiry Committee (1930-31) which calls for stringent measures to cope with it urgently. The Bengal Pharmaceutical Association drew the attention of the authorities concerned towards the miserable plight of compounders on account of the defective training and the result was that the State Medical Faculty of Bengal appointed a sub-committee to revise their syllabus. Colonel Chopra, I.M.S., was its Chairman. The committee finished

their task and submitted their report along with a thorough and comprehensive syllabus properly drawn up by them at the meeting of the Governing Body of the said Faculty held on the 17th February, 1934. It was approved of and unanimously passed in the said meeting. The committee strongly recommended it for an early introduction. It is a matter of great surprise that about two years have elapsed and it is still lying unapproved of by the Government of Bengal. We do not know the fate of it. I dare say if the new curriculum be introduced, the development of pharmaceutical industry will be considerably helped by the newly-trained compounders (pharmacists). Without well-trained personnel the serious situation created by the adulterated drugs cannot be improved.

Under these circumstances I, with all emphasis, draw the special attention of the Government of Bengal for the introduction of the new syllabus at any rate by the next session for the training of the compounders (pharmacists), as a preliminary action for the prevention of sale of spurious drugs and as an essential part of the legislation proposed. I also urge both the provincial and Central Governments to give effect to the recommendations of the Drugs Enquiry Committee as early as possible which are so vital to the well-being of the country and its people.—Yours, etc.,

KARUNA KUMAR ACHARJEE,
Member, Bengal Pharmaceutical
Association, Standing Committee.

AMARAGORI CHARITABLE DISPENSARY,
POST KUNDULIA, HOWRAH,
23rd November, 1935.

UNUSUAL IDENTIFICATION OF EXPLOSIVE

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the September issue, 1935, of your esteemed journal it has been mentioned, on page 506, by Dr. N. J. Vazifdar, that after a bomb explosion 'arsenic' enters into the system through the wound and also by inhalation of arsenuretted hydrogen which is evolved in the explosion.

A bomb of the type under discussion explodes due to the interaction of sulphide of arsenic with an oxidizing agent such as 'potassium chlorate' and there is no likelihood, under the circumstances, of any trace of arsenuretted hydrogen being formed.

It is not arsenuretted hydrogen, but 'oxide of arsenic' in gaseous state or in solid state of very fine subdivision, which is formed as a result of explosion, enters into the system.—Yours, etc.,

T. C. BASU CHOWDHARY.

THE EYE CLINIC,
REKAGUNJ ROAD,
AGRA,
1st January, 1936.

THE TREATMENT OF LOBAR PNEUMONIA WITH INTRAVENOUS INJECTIONS OF ALCOHOL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I have read the article 'The Treatment of Lobar Pneumonia with Intravenous Injection of Alcohol' written by Captain Ilahi Bakhsh, I.M.S., and Captain A. T. Andreasen, I.M.S. I wish to treat cases of pneumonia according to their opinion, but confusion arises in my mind. The writers advise to inject a solution of 20 per cent alcohol in sterile normal saline. I wish to know what sort of alcohol, whether absolute alcohol or a liquor which contains 20 per cent alcohol?

Also I wish to know if I use 'Vini Gallici No. 1' how much proportion shall I add in 20 c.cm., because 'Vini Gallici No. 1' contains only 47 to 57 per cent of alcohol?

Yours, etc.,

SOURENDRA NATH MITTRA, L.M.F.

INDAS (BANKURA),
3rd January, 1936.

The above letter was forwarded to Captain Andreasen who has sent us the following information:—

[Note.—'The alcohol used is rectified spirit. The strength used is:—33½ per cent rectified spirit in normal (sterile) saline. The dose is 20 to 25 c.cm. of this mixture. We have recently found that adding sufficient sterile sodium bicarbonate solution (gr. xx to ㉟i) to this mixture to render it just alkaline seems to eliminate the rigors which sometimes follow the injection. This addition of sodium bicarbonate is not always necessary because the mixture may be already neutral or alkaline'.—EDITOR, I. M. G.]

JHIN-JHINIA AND ITS CURE

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I am a subscriber of your journal with the hope of getting some experience in it. Though I have got no special privilege to bring forward before you in medical points of view—I cannot help but writing a few lines:—

It is my earnest request I shall be very much obliged if you kindly pay a little attention to the following:—

In some parts of Bengal many people are suddenly attacked with a kind of disease which seems to me to be 'Neuro-Toxæmia' called Chin-chinia (ঝিন-ঝিনিয়া) in Bengali. It is found that some patients are getting attacked with pneumonia due to constant pouring of water and applying ice-bag on the head. Again it is very often found in our Mofussil, patients are lying dead in the open-field and path for want of water and company.

It is a matter of regret no remedy is yet out for the convenience of the public.

On investigation I have practically used an internal medicine on more than 100 patients without applying water and ice-bag on head and the people in our locality are getting a charming benefit thereby.

In any stage of the patient when the medicine taken internally the great prominent symptoms such as unconsciousness, severe throbbing of the limbs and burning sensation of the higher centres will be off in 2 to 5 minutes and the patient will be relieved perfectly within half an hour.

I hope if you kindly take a little interest for this medicine it would be great service to the public for which I may send some samples for trial if you kindly permit.

Yours, etc.,
B. P. M.,
Medical Practitioner.

HOWRAH DISTRICT,
20th January, 1936.

[Note.—We reproduce this letter exactly as it was received except that we have replaced the full name by initials only and have deleted the address. We have made these modifications in view of the fact that our correspondent has omitted, possibly inadvertently, to mention the name or nature of the charm-affecting drug. Those who have read our editorial comments on this disease will possibly be interested in this letter. We might mention, however, that we cannot divulge either the name or address of our correspondent, B. P. M.—EDITOR, I. M. G.]

Service Notes

APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL SIR FRANK P. CONNOR, *Kt.*, D.S.O., K.H.S., Surgeon-General with the Government of Madras, is appointed to officiate as Director-General, Indian Medical Service, with effect from the 29th October, 1935 (afternoon), *vice* Major-General C. A. Sprawson, granted leave.

Lieutenant-Colonel A. J. H. Russell, C.B.E., V.H.S., is appointed Honorary Surgeon to the King, and is promoted Brevet-Colonel, 12th August, 1935, *vice* Colonel C. A. Gill, retired.

Lieutenant-Colonel R. N. Chopra, C.I.E., is appointed Honorary Physician to the King and is promoted Brevet-Colonel, 19th August, 1935, *vice* Major-General Sir Robert McCarrison, C.I.E., retired.

The Viceroy and Governor-General has been pleased to make the following appointment on His Excellency's personal staff—

To be Honorary Surgeon

Lieutenant-Colonel J. Taylor, D.S.O., *vice* Lieutenant-Colonel A. J. H. Russell, C.B.E., V.H.S., vacated. Dated 30th October, 1935.

Lieutenant-Colonel W. M. Will is appointed Assistant Director-General, Indian Medical Service (Stores), with effect from the 28th October, 1935.

Lieutenant-Colonel J. Rodger, M.C., Residency Surgeon and Chief Medical Officer in Baluchistan, is appointed to officiate as Civil Surgeon, Quetta, in addition to his own duties, with effect from the forenoon of the 30th October, 1935, and until further orders.

The services of the undermentioned officers of the Indian Medical Service are placed permanently at the disposal of the Government of Burma, with effect from the dates mentioned against the name of each officer:—

1. Lieutenant-Colonel R. H. Malone. Dated 26th January, 1934.

2. Major G. M. Moffat. Dated 1st March, 1934.

3. Major G. M. Irvine. Dated 8th April, 1935.

Major M. P. Atkinson, an Agency Surgeon, on return from leave, is posted as Agency Surgeon, Gilgit, with effect from the afternoon of the 4th October, 1935.

The services of Major [Name] are replaced at the disposal of the [Name] Provinces, with effect from the afternoon of 25th October, 1935.

The services of Captain H. S. Waters are replaced at the disposal of the Government of Bombay, with effect from the 28th October, 1935.

Captain B. Chaudhuri, Senior Medical Officer, Andaman and Nicobar Islands, is appointed as Superintendent, Cellular Jail, Port Blair, in addition to his own duties, with effect from the afternoon of the 30th October, 1935, until further orders, *vice* Major L. H. M. Upshon, V.D., granted leave preparatory to retirement.

The following appointments are made:—

To be Lieutenants

Dated 23rd September, 1935

Rajmal Kasliwal.
Muhammad Abu Nasar Moezuddin, B.Sc. (Luck.).

Dated 30th September, 1935

Tahil D. Chablani.

Dated 2nd October, 1935

Satyanarayana Sunkavally.

Dated 7th October, 1935

Ramaswami Duraiswami Ayyar.

Dated 10th October, 1935

Addanki Seshgiri Rao.

Ram Lal Soota.

Dated 11th October, 1935

Moti Lal Shankhla, B.Sc. (Bom.).

Dated 22nd October, 1935

Drishnier Subramania Aiyer.

LEAVE

Major-General C. A. Sprawson, C.I.E., K.H.F., Director-General, Indian Medical Service, is granted leave on average pay for 2 months and 7 days combined with leave on half average pay for 1 month and 24 days, with effect from the 29th October, 1935 (afternoon).

Brevet-Colonel A. J. H. Russell, C.B.E., K.H.S., Public Health Commissioner with the Government of India, is granted leave for 8 months, with effect from the 8th September, 1935.

Lieutenant-Colonel P. Banerji, Civil Surgeon, is allowed leave for 4 months, with effect from the 22nd November, 1935.

Lieutenant-Colonel S. R. Prall, Superintendent, St. George's Hospital, Bombay, is granted leave on average pay for 6 months and 25 days, with effect from the 21st March, 1936.

Major L. K. Ledger, an Agency Surgeon, is granted leave on average pay for 4 months and 14 days combined with leave on half average pay for 4 months and 16 days, with effect from the afternoon of the 4th October, 1935.

PROMOTIONS

Colonel to be Major-General

A. W. M. Harvey, K.H.S. Dated the 14th November, 1935.

Lieutenant-Colonels to be Colonels

S. S. S. Houghton, O.B.E. Dated the 24th November, 1935, with seniority 1st March, 1930.

P. S. Mills. Dated 21st August, 1935, with seniority 1st August, 1929.

D. C. V. FitzGerald, M.C. Dated 22nd October, 1935, with seniority 1st February, 1930.

Notes

THE HISTIDINE TREATMENT

'Hypolom' histidine hydrochloride, a product of Burroughs Wellcome and Company, Snow Hill Buildings, London, E.C. 1, is a sterile, 4 per cent solution of histidine hydrochloride, ready for immediate use in cases of gastric and duodenal ulcers. The accumulated evidence of many cases shows a favourable response to this seemingly rational method of

treatment. Histidine, alone, and without dietary restrictions, has been shown to be effective in cases of ulcers of the mild type, gain in weight and improved nutrition being particularly evident. The treatment consists of daily intramuscular or subcutaneous injections for three weeks, of 5 c.cm. of a 4 per cent solution of histidine hydrochloride. No other medication is necessary, and a minimum, if any, of dietary

restrictions. 'Hypoloid' brand histidine hydrochloride 4 per cent in 5 c.cm. is supplied in boxes of 5 'Hypoloid' ampoules.

THE BLOODLESS PHLEBOTOMIST

WE have just received a copy of *The Bloodless Phlebotomist*, Vol. VIII, No. 3, which is being mailed to every physician in India.

This little journal published by the Denver Chemical Manufacturing Company of New York is replete with interesting articles written by physicians who are located in many different countries and while the purpose of the publication is to acquaint its medical readers with antiphlogistine, the physicians will find a number of items and illustrations which will excite their curiosity and interest—altogether, the little journal is well worth reading and we note that 1,450,500 copies are printed in nine languages and distributed to every doctor in the world with a known address, excepting in the countries of Russia, Latvia and Bulgaria.

If you do not receive a copy write to the Denver Chemical Manufacturing Company, New York, who will place your name on their list. The journal will be supplied you free of all charges.

HORLICK'S INDIAN CALENDAR FOR 1936

WE have received a copy of the 1936 wall calendar which is being widely distributed in India by the Horlick's Malted Milk Company, Ltd.

This firm's calendars are always conspicuous for their interest. The present one is no exception, though in subject-matter it represents a departure from the calendars issued in the past, which have generally illustrated famous scenes or subjects from the mythology or history of India.

The 1936 calendar carries an illustration of the impressive and colourful scene in St. Paul's Cathedral, the heart of the Empire, during the Thanksgiving Service held there on the occasion of the Silver Jubilee of the King-Emperor. There are two smaller illustrations, one of Their Majesties driving in state to the Cathedral, and the other showing them kneeling in prayer.

CEROCOL

COLLOIDAL CERIUM OXALATE

IN 1854 Sir James Y. Simpson discovered the sedative and tonic action of cerium oxalate. At the same time, he also recognized its special value in the prevention of vomiting in pregnancy and introduced it into medicine in this direction.

Cerium oxalate is an almost insoluble salt (its solubility in water is 1-8175). After oral administration it is found unchanged in the faeces. It is therefore presumed that the salt is incapable of being absorbed by the mucous membranes and its action must be regarded as mechanical, similar to that of bismuth.

Although the majority of authors agree as to the beneficial effect of cerium oxalate, its action so far has not been exactly determined.

Cerocol is a colloid-soluble form of cerium oxalate which is readily absorbed, consequently a uniform action in the prevention of vomiting of all kinds is attained.

Cerocol tablets contain 0.05 gram colloidal cerium oxalate.

Advantages.—The recently discovered colloid-soluble form of Cerocol represents a decided advantage over cerium oxalate as previously prescribed. Even those patients who usually experience a difficulty in swallowing tablets find no difficulty with Cerocol.

The tablets are small and disintegrate immediately upon the tongue. They cannot give rise to irritation with resulting vomiting.

The tablets are tasteless.

They contain no narcotics nor alkaloids, and cause no after effects, such as dryness of the throat, nor any of those other unpleasant symptoms which frequently accompany the administrations of belladonna, scopolamine, hyoscyamin, etc.

The tablets are non-poisonous, even multiple doses are harmless.

Dosage.—Emesis and hyperemesis 2 tablets before rising. In severe cases a further 2 tablets during the day.

FAMOUS COMPANY HONOURED

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Original Articles

THE ÆTIOLOGY OF BLACKWATER FEVER

By K. V. KRISHNAN, M.B.B.S., M.R.C.P., D.B., D.Sc.

Professor of Malariology and Rural Hygiene
and

N. G. PAI, M.A.

(The All-India Institute of Hygiene and Public Health,
Calcutta)

Introduction

THE ætiology of blackwater fever is one of the unsolved puzzles in tropical medicine. Although several investigators have studied the various problems connected with it (Thompson, 1924, and Ross, 1932) the factors concerned in the causation of this condition are, even now, not clearly understood. One of the chief difficulties in the way of progress has been the lack of suitable and sufficient experimental material. The recent discovery by Napier and Campbell (1932) of a monkey plasmodium (*P. knowlesi*) capable of producing hæmoglobinuria in susceptible species has to some extent overcome this difficulty and given a fresh impetus to the study of the problems connected with hæmolysis and hæmoglobinuria. The work on monkeys that is being conducted at present will, it is hoped, not only throw light on the factors involved in hæmolysis and hæmoglobinuria in these animals but also indicate the mode of production of blackwater fever in man. In this article, therefore, an attempt is made to present the various questions relating to the ætiology of blackwater fever that are awaiting an answer and to discuss them in the light of results obtained in recent researches on monkeys by us in the belief that the underlying factors in hæmoglobinuria of monkeys are fundamentally the same as those in blackwater fever in man.

Is blackwater fever a disease per se or a manifestation of malaria?

The isolation of a spirochæte (*S. biliohæmoglobinuria*) by Blanchard and Lefrou (1922) and a few others, from a certain number of blackwater fever cases, gave rise to the suggestion that this organism may be the ætiological agent of the disease. But the failure of Blacklock, Leger, Thompson (1924), Ross (1932) and several others to find the organism in the blood or urine of blackwater fever cases, even after repeated examinations, indicated that the disease was not of spirochætal origin.

The consensus of opinion at present is that it is a manifestation or complication of malaria and this opinion is based on the following observed facts:—Blackwater fever generally occurs in certain hyperendemic malarial areas; it does not occur in non-malarious areas nor in

areas where epidemic or low-endemic malaria prevails. If and when blackwater fever cases occur in non-malarious localities, the patients invariably give a history of previous residence in hyperendemic malarious areas. While blackwater fever is rare among the indigenous inhabitants of hyperendemic areas it is frequently met with among the susceptible immigrant population. Such of the immigrant population that suffer most from malaria are also those that develop blackwater fever. It is only after repeated attacks of malaria that blackwater fever results—primary infections being rarely accompanied by hæmoglobinuria and a residence of at least 6 months to 4 years being necessary before the blackwater condition develops. The incidence of blackwater fever cases is most common in the malarial season or shortly after it and there is also a close correlation between the number of malarial cases and the number of blackwater fever cases in the endemic areas.

In 75 to 90 per cent of blackwater fever cases malarial parasites can be demonstrated in the blood either a few days before the onset or a few days after the disappearance of hæmoglobinuria. The majority of the cases show malignant tertian parasites, but in a few cases benign tertian and quartan parasites have also been seen. Post-mortem findings in blackwater fever cases are enlarged spleen, pigment, parasites, and other evidence of malaria. Whenever malaria control is properly effected, blackwater fever disappears from the locality.

These findings not only establish that malaria is an essential condition precedent to blackwater fever but they also indicate that the predisposition to blackwater fever induced by malaria may be due either to a specially virulent strain of the malarial parasite prevalent in the endemic areas, or to a lowering of host resistance to blackwater fever through repeated attacks of malaria or to both.

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restrictions. 'Hypoloid' brand histidine hydrochloride 4 per cent in 5 c.cm. is supplied in boxes of 5 'Hypoloid' ampoules.

THE BLOODLESS PHLEBOTOMIST

We have just received a copy of *The Bloodless Phlebotomist*, Vol. VIII, No. 3, which is being mailed to every physician in India.

This little journal published by the Denver Chemical Manufacturing Company of New York is replete with interesting articles written by physicians who are located in many different countries and while the purpose of the publication is to acquaint its medical readers with antiphlogistine, the physicians will find a number of items and illustrations which will excite their curiosity and interest—altogether, the little journal is well worth reading and we note that 1,450,500 copies are printed in nine languages and distributed to every doctor in the world with a known address, excepting in the countries of Russia, Latvia and Bulgaria.

If you do not receive a copy write to the Denver Chemical Manufacturing Company, New York, who will place your name on their list. The journal will be supplied you free of all charges.

HORLICK'S INDIAN CALENDAR FOR 1936

We have received a copy of the 1936 wall calendar which is being widely distributed in India by the Horlick's Malted Milk Company, Ltd.

This firm's calendars are always conspicuous for their interest. The present one is no exception, though in subject-matter it represents a departure from the calendars issued in the past, which have generally illustrated famous scenes or subjects from the mythology or history of India.

The 1936 calendar carries an illustration of the impressive and colourful scene in St. Paul's Cathedral, the heart of the Empire, during the Thanksgiving Service held there on the occasion of the Silver Jubilee of the King. There are two smaller illustrations, one showing a driving in state to the Cathedral, and the other showing them kneeling in prayer.

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example why a long residence in a blackwater area is a preliminary to the onset of the condition, why first attacks of malaria caused by the hæmolytic strain do not result in blackwater fever, and why only persons most susceptible to malaria generally fall victims to the disease, are not explained by it. Taking an impartial view of the question, however, it seems that a 'biological strain' of the malarial parasite (meaning by the term not necessarily a toxin-producing strain but a strain differing in some other respect, such as biochemical activity, pathogenicity, etc.) is most probably concerned. But even this assumption of a special strain will not in itself be sufficient to explain all known facts relating to blackwater fever. The factor of host response to malarial infection appears to us to be of far greater importance than the parasite factor. Unless the host factor is taken into account it seems that an accurate and complete picture of blackwater fever will be difficult to obtain.

Is the nature of host response to malaria an important factor in the causation of blackwater fever?

That repeated attacks of severe malaria and increased susceptibility of the individual to malaria play an important part in the ætiology of blackwater fever is established by epidemiological findings. The higher incidence of the condition in susceptible immigrants residing in certain hyperendemic malarial areas, and in people who had previously been attacked with severe malaria, supports this view. This assumption also explains why a certain period of residence in blackwater areas is necessary before the predisposition to the disease is acquired. Confirmatory experimental proof of this theory has recently been obtained in monkeys infected with *P. knowlesi*. It has been shown that hæmoglobinuria ordinarily occurs as a complication of malaria only in the susceptible *rhesus* monkeys and not in the relatively more resistant *irus* and *radiatus* monkeys (Napier and Campbell, 1932). Even in the susceptible *rhesus* monkeys dying of intense infection all do not develop the condition (Krishnan, 1935). It is in only those in which the infection develops rapidly and intensely that hæmoglobinuria is met with (Krishnan, Smith and Lal, 1933). By lowering the resistance of *irus* and *radiatus* monkeys, which do not suffer from hæmoglobinuria ordinarily, by splenectomy, we have shown (Krishnan, Smith and Lal, 1933) that hæmoglobinuria can be induced in some of them. All these suggest that, in the monkey and perhaps also in man, the host factor is of greater importance than the parasite factor.

The recent work on the mechanism of resistance to malaria and hæmoglobinuria has shown that some of the factors involved are common to both. For example, the functional efficiency of the reticulo-endothelial system has been

shown to be of importance in the overcoming of both the malarial infection and the hæmoglobinuric state. Therefore the nature of the host response to the initial malarial infection, it may be presumed, would greatly determine whether the host is likely to acquire an immunity or a predisposition to hæmoglobinuria. If the host acquires resistance to malaria, he would also develop immunity to hæmoglobinuria, but on the other hand if no such resistance is acquired by the host he would run the risk of developing hæmoglobinuria and every subsequent attack of malaria would greatly increase the chances of its onset. Such a view would be fully justified if we picture infection merely as a stimulus to the acquirement of immunity. As a stimulus is equally capable of acting either as an excitant or a depressant, depending upon the prevailing condition, it is conceivable how repeated attacks of malaria would in some depress the immunity response and produce conditions favourable for the onset of hæmoglobinuria, and do the opposite in others. If this view is accepted then the question of real importance to be considered in connection with the ætiology of blackwater fever is—What changes in the host induced by malaria lead to a predisposition to blackwater fever?

What changes in the host induced by malaria lead to a predisposition to blackwater fever?

The changes induced by malaria in a host which result in a predisposition to blackwater fever are not all very well understood. There are, however, a number of theories with regard to them and they may be considered under two main heads—cytological and biochemical. The former refers to changes in the reticulo-endothelial cells, the red cells, etc., and the latter to alterations in certain constituents in the blood such as cholesterol, glucose, phosphorus, bicarbonate, acids, etc. It is probable that more than one change is induced by malaria and these are concerned in bringing about a predisposition to blackwater fever. It is possible that these changes are more closely inter-related with one another than they appear at first sight.

(a) *Damage and dysfunction of the reticulo-endothelial system.*—It is well known that one of the important functions of the reticulo-endothelial system is phagocytosis and clearance of foreign particulate matter from the blood. In the course of malaria large quantities of debris are liberated into the blood at each sporulation in the form of red cell stroma, hæmoglobin, parasites and pigment and they have all to be cleared by the cells of the reticulo-endothelial system. It is possible, therefore, that repeated attacks of severe malaria might tax this system in some individuals to such an extent as to cause certain changes of a temporary or permanent nature in its proliferative and functional capacities as well as in its powers of mobilization. When such a change characterized by a damage and dysfunction of the system

has been established, conditions would not only be favourable for hæmolysis but also for the onset of hæmoglobinuria. Under these circumstances, an agent which ordinarily is incapable of bringing about hæmolysis would not only induce it, but would also lead to hæmoglobinuria, because the mechanism for clearance of hæmoglobin is defective and this substance is likely to accumulate beyond the threshold level of the kidney and get excreted in the urine. If the reticulo-endothelial system is able to respond to this final stimulus of a massive dose of hæmoglobin, hæmoglobinuria would cease and the host would recover; if not, the hæmoglobinuria would persist and end in the death of the host.

This theory is supported by convincing experimental evidence. A study of the histological changes in the spleen, which is an important store-house for reticulo-endothelial cells, shows that in hæmoglobinuric monkeys the evidence of proliferation and mobilization of these cells so characteristic of the non-hæmoglobinuric resistant monkeys is entirely absent. A similar picture of a failure of response of the reticulo-endothelial cells is also seen in the peripheral blood of hæmoglobinuric monkeys (Krishnan, Lal and Napier, 1933). In these animals prior to the onset of hæmoglobinuria, not only does the number of reticulo-endothelial cells get fewer but their functional capacity, as tested by their ability to ingest neutral red, is also diminished (Krishnan, 1935).

Furthermore splenectomy experiments have fully corroborated this view and shown that the removal of the organ results in an increase of susceptibility to malaria and hæmoglobinuria (Krishnan, 1935). Even in the resistant species of monkeys (*irus* and *radiatus*), which ordinarily do not show hæmoglobinuria, splenectomy followed by infection with *Plasmodium knowlesi* results in hæmoglobinuria in a fairly high percentage of cases (Krishnan, Smith and Lal, 1933). Hæmoglobinæmia, which has been observed to be a precursor of hæmoglobinuria in man and in monkeys, lends further indirect support to this theory; for had the reticulo-endothelial system been able to perform its functions properly hæmoglobinæmia would not have occurred, except perhaps as a very transient condition.

From these it appears that the damage to the reticulo-endothelial system that is induced by malaria in certain very highly susceptible people is undoubtedly an important factor in the ætiology of blackwater fever. It should, however, be pointed out that while this theory explains why hæmoglobinuria occurs in some and is prevented in others it fails to indicate how hæmolysis is actually caused. The questions as to whether there is a hæmolytic agent concerned and if so what is its nature are not answered by this theory.

(b) *Alteration in red cells.*—This theory suggests that repeated attacks of malaria bring

about some alteration in the quality of the red cells which renders them more liable to hæmolysis than normal cells. Whether this alteration is merely a variation in the physical properties of the cells or in their chemical constitution it is difficult to say. Any experiment undertaken to test the nature or significance of cell alterations in hæmolysis must necessarily be planned after a careful consideration of the agents and mechanism involved in hæmolysis. Lack of knowledge regarding these factors has stood in the way of devising suitable experiments.

It is well known that hæmolysis is brought about by a variety of factors, varying from the simple physical phenomenon of osmosis to the more complicated processes due to the specific action of chemical agents. The criteria involved in each of these would be widely different as also the significance of the different alterations in the cells. In the belief that hæmolysis is caused by osmotic changes, many investigators tried to demonstrate that the red cells from normal individuals differed from those obtained from blackwater fever cases in their ability to withstand the action of hypotonic saline solution. As these results were not uniform it led another group of investigators to study the question from the chemical point of view. The inhibitory action of cholesterol on hæmolysis brought about by certain agents like saponin has been known for a long time (Leathes and Raper, 1925). It was thought that a study of the variation in this constituent would not only indicate the mode of action of the hæmolytic agent, but would also show the nature of the cell alteration, if any occurred. Krishnan and Pai (1936) showed that in monkeys there is a marked diminution in cholesterol in the pre-hæmoglobinuric state and that hæmoglobinuria did not develop in the animals in which free cholesterol was normal or above normal. This suggested that the agent causing hæmolysis is one which is favoured by hypocholesterinæmia and inhibited by hypercholesterinæmia. In the case of monkeys, although Krishnan and Pai have not actually shown that the lowering of free cholesterol noted by them is due to a depletion of this constituent from the red cells, yet the evidence adduced by them indicates that such an assumption is justifiable. From this it follows that if it could be shown that the cholesterol of the red cells is altered in cases of blackwater fever in man then such a change would be an important factor in determining the extent of hæmolysis and hæmoglobinuria.

(c) *Cholesterol changes.*—Cholesterol is an important constituent of cells, cell membranes and plasma and is recognized to have an inhibitory effect on hæmolysis caused by agents such as fatty acids, and saponin. In the belief that in blackwater fever a hæmolytic agent of the saponin type may be involved, a large number of workers (Ross, Whitmore, Nocht, etc.) have studied the total cholesterol changes in this

condition. The results, although not uniform, indicated that hypocholesterinaemia preceded the onset of blackwater fever in a certain percentage of cases. Krishnan, Ghosh and Bose (1936) obtained similar results in cases of hæmoglobinuria in monkeys. The study of cholesterol changes by Krishnan and Pai (1936) with special reference to the two forms in which it is known to be present (free and ester) gave more conclusive results. These workers have shown that in the pre-hæmoglobinuric state there is a distinct lowering of free cholesterol and an increase in ester cholesterol in all cases studied. There was also a definite indication of a mobilization of free cholesterol in those cases that failed to develop hæmoglobinuria. From these observations the conclusion was drawn that free cholesterol was important as regards inhibition of hæmolysis and the hæmolytic agent is one which exerts its activity in the absence of a sufficient amount of free cholesterol. This incidentally explained the variable nature of results obtained in man with reference to total cholesterol and emphasized the necessity for a study of free and ester cholesterol separately in blackwater fever cases.

It has been observed by many that repeated attacks of malaria have a tendency to lower blood cholesterol (Krishnan, Ghosh and Bose, 1936). But there is a difference as regards the ability to mobilize cholesterol in those who have developed an immunity to malaria and those who have developed a predisposition to blackwater. While the former respond with an increase of cholesterol as a result of the stimulus of infection or treatment, the latter show a further fall in cholesterol. It seems therefore likely that one of the ways in which malaria predisposes to blackwater is by depleting free cholesterol either from the medium or the cells or both and by damaging the cholesterologenetic centres. This in our opinion appears to be a very important factor in the predisposition to blackwater fever.

(d) *Alterations in glucose.*—The importance of glucose for the growth and development of hæmo-protozoa, both *in vivo* and *in vitro*, has been demonstrated by several workers. So far as the malarial parasite is concerned the work of Hegner and MacDougall (1926) and of Bass and Johns (1913) fully justifies this view. The observation made by some other workers that glucose changes in the blood of malarial subjects have not indicated any distinct or significant alteration in every case studied (Rudolf and Marsh, 1927) cannot be interpreted as lessening in any way the importance of glucose as an essential factor in the growth of the malarial parasite. For we believe that the concentration of glucose in the blood will vary not only according to the intensity of the malarial infection but also according to the ability of the host to mobilize glucose in the blood.

This view is partly corroborated by the results of Otero (1932), and Tschilow and Mladenow (1934). The fact that in all intense infections in monkeys (Krishnan and Pai, 1936) a marked lowering of glucose invariably occurred suggests that under suitable experimental conditions it can be shown that a stage will be reached when the animal will be unable to mobilize the necessary glucose in the blood. This inability to mobilize glucose may be followed by, or be the result of, an upset in the carbohydrate metabolism. That such an upset does occur is indicated by the observation that an increase in the inorganic phosphorus of the blood is associated with the depletion in glucose, and the injection of glucose and insulin decreases the inorganic phosphorus. This altered metabolism of carbohydrates probably leads to the development of the hæmolytic agent and to a predisposition to hæmolysis and hæmoglobinuria. If this is so in monkeys, then it is conceivable how in some men, as a result of repeated attacks of malaria, the capacity of the body to utilize glucose in the normal way may be seriously altered, temporarily or permanently, and thus lead to a predisposition to blackwater fever.

The mere study of the glucose changes in the blood of blackwater fever cases may not indicate the extent of damage to carbohydrate metabolism and this may be the reason why such studies so far have not given any clue regarding any upset of the carbohydrate metabolism in man. That an upset of this metabolism does occur in man, as in the monkey, in the pre-hæmoglobinuric state is highly probable from other evidence as well. We believe that it is essential to consider this factor as being of far-reaching importance both in the ætiology and in the treatment of blackwater fever.

(e) *Alteration in inorganic phosphorus.*—The variations in inorganic phosphorus occurring in blackwater fever in man have been studied by a few investigators (Matko, 1918; Whitmore, 1928; Ross, 1932). Whitmore noticed an increase in this constituent but Ross obtained variable results. Matko advanced the view that alterations in phosphorus metabolism were responsible for hæmolysis, while Ross came to the conclusion that upsetting of the phosphorus metabolism was 'neither a preliminary to nor responsible for the intravascular hæmolysis'. The study of the alteration in this constituent in malarial hæmoglobinuria of monkeys (Krishnan and Pai, 1936) showed that there was a distinct tendency for the inorganic phosphorus to rise in the pre-hæmoglobinuric state in both splenectomized and non-splenectomized animals. In non-splenectomized monkeys not developing hæmoglobinuria, no such rise was noticed. This rise has been partly accounted for by these workers as being due to the rapid utilization of sugar through the hexose-phosphates of the corpuscles, and to the derangement of the carbohydrate metabolism. Their view appears to be

substantiated by the fact that diminution in inorganic phosphorus occurs in these cases as a result of the injection of glucose and insulin. From this it seems that the rise in inorganic phosphorus, if it occurs in blackwater fever, can not only be interpreted as being due to nitrogenous retention as shown by Ross (1932) but also as indicating a derangement in carbohydrate metabolism which appears to be an essential condition for the production of the hæmolytic agent. An absence of a rise in inorganic phosphorus does not necessarily indicate the contrary. Inorganic phosphorus may or may not be concerned directly with hæmolysis, but it does indicate the nature of the processes at work and the possible source and nature of the hæmolytic agent.

(f) *Alterations in organic phosphorus as lecithin.*—We are not aware of any work on the variations in organic phosphorus as lecithin in malaria or blackwater fever. The work of Krishnan and Pai (1936) in malarial hæmoglobinuria of monkeys shows that there is a marked increase in organic phosphorus in the pre-hæmoglobinuric state, that the increase is less pronounced in those not developing hæmoglobinuria, and least in those recovering from intense infection. This finding taken in conjunction with the rise in ester cholesterol observed (*vide supra*) suggests that as a result of intense malarial infection fatty acids are being produced and are accumulating and that one method of their disposal is by the formation of lecithin. It is difficult to say what part this rise in lecithin plays in hæmolysis. It seems that the alteration in the ratio between lecithin and free cholesterol is of some importance. When the ratio is high, conditions seem to favour the onset of hæmolysis and when it is normal or low hæmolysis is inhibited. It is also possible that the presence of lecithin in high concentration may lead directly or indirectly to the formation of hæmolysin. It would be interesting to study the variations in organic phosphorus as lecithin in human cases of blackwater fever, and until it is done it will not be possible to state whether in man there is a similar increase or not, whether it is brought about in a similar manner and whether it has a similar rôle to play. We believe that alterations in lecithin do play a part, directly or indirectly, in the hæmolytic process.

Is there a hæmolytic agent involved and if so what is its nature?

Hæmolysis of red cells may be due to a simple physical phenomenon like osmosis or to more complicated processes due to chemical agents. It is almost impossible to associate the hæmolysis leading to hæmoglobinuria in blackwater fever in man to merely physical phenomena. Although no one has been able to demonstrate the presence of a hæmolysin the assumption

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(a) *Auto-hæmolysin.*—Thompson (1924) observed some peculiar forms of red cells in malignant tertian malaria, and suggested that these may be antigenically different from normal cells and may give rise to hæmolytic antibodies. He believed that in blackwater fever cases these altered red cells were present in large numbers and that when the specific antibody was formed hæmolysis occurred. Normally, the body does not produce antibodies to its own red cells; it does so only if foreign red cells are introduced. Therefore, unless it can be shown that the abnormal red cells seen in blackwater fever cases are antigenically different from normal red cells, that they can induce the formation of antibodies, and that these antibodies are hæmolytic, this hypothesis cannot be accepted. Furthermore, the hæmolysin detected by a few workers in the sera obtained from some of the blackwater fever cases has not been shown to be of the nature of an auto-hæmolysin.

(b) *Toxin of malarial parasite.*—This hypothesis has already been discussed to some extent in the section on the 'biological strain' of the malarial parasite. Here it needs only to be emphasized that a 'biological strain' meaning a strain which is particularly capable of inducing pronounced metabolic changes and leading to the formation of hæmolytic substances in the body of the host is probably concerned. Such an assumption seems to be justified because that alone helps to explain the total absence of blackwater fever in certain hyperendemic malarial areas and the reputed house and familial distribution of cases in some localities. In view of the evidence presented in the other sections in this paper suggesting that profound alterations in the glucose and fat metabolisms in conjunction with a damaged state of the liver are the predisposing factors to hæmolysis the assumption of an exotoxin of the parasite seems to be unnecessary. Furthermore, no one has isolated it or described its qualities, and the onus of proof of this rests with those who make the assumption.

(c) *Hæmolysins such as fatty acids arising out of an alteration in metabolism.*—Several observers have found in chronic malaria evidence of an upset of the acid base equilibrium and a lowering of the bicarbonate reserve. This suggests that in the course of malaria there is overproduction of acid and that possibly this reaches a stage in some persons when hæmolysis can be readily caused. Blacklock and Macdonald (1928) have strongly supported this view and have incriminated lactic acid as a possible agent. The work of Ross (1932), however, shows that

condition. The results, although not uniform, indicated that hypocholesterinæmia preceded the onset of blackwater fever in a certain percentage of cases. Krishnan, Ghosh and Bose (1936) obtained similar results in cases of hæmoglobinuria in monkeys. The study of cholesterol changes by Krishnan and Pai (1936) with special reference to the two forms in which it is known to be present (free and ester) gave more conclusive results. These workers have shown that in the pre-hæmoglobinuric state there is a distinct lowering of free cholesterol and an increase in ester cholesterol in all cases studied. There was also a definite indication of a mobilization of free cholesterol in those cases that failed to develop hæmoglobinuria. From these observations the conclusion was drawn that free cholesterol was important as regards inhibition of hæmolysis and the hæmolytic agent is one which exerts its activity in the absence of a sufficient amount of free cholesterol. This incidentally explained the variable nature of results obtained in man with reference to total cholesterol and emphasized the necessity for a study of free and ester cholesterol separately in blackwater fever cases.

It has been observed by many that repeated attacks of malaria have a tendency to lower blood cholesterol (Krishnan, Ghosh and Bose, 1936). But there is a difference as regards the ability to mobilize cholesterol in those who have developed an immunity to malaria and those who have developed a predisposition to blackwater. While the former respond with an increase of cholesterol as a result of the stimulus of infection or treatment, the latter show a further fall in cholesterol. It seems therefore likely that one of the ways in which malaria predisposes to blackwater is by depleting free cholesterol either from the medium or the cells or both and by damaging the cholesterologenetic centres. This in our opinion appears to be a very important factor in the predisposition to blackwater fever.

(d) *Alterations in glucose*.—The importance of glucose for the growth and development of hæmo-protozoa, both *in vivo* and *in vitro*, has been demonstrated by several workers. So far as the malarial parasite is concerned the work of Hegner and MacDougall (1926) and of Bass and Johns (1913) fully justifies this view. The observation made by some other workers that glucose changes in the blood of malarial subjects have not indicated any distinct or significant alteration in every case studied (Rudolf and Marsh, 1927) cannot be interpreted as lessening in any way the importance of glucose as an essential factor in the growth of the malarial parasite. For we believe that the concentration of glucose in the blood will vary not only according to the intensity of the malarial infection but also according to the ability of the host to mobilize glucose in the blood.

This view is partly corroborated by the results of Otero (1932), and Tschilow and Mladenow (1934). The fact that in all intense infections in monkeys (Krishnan and Pai, 1936) a marked lowering of glucose invariably occurred suggests that under suitable experimental conditions it can be shown that a stage will be reached when the animal will be unable to mobilize the necessary glucose in the blood. This inability to mobilize glucose may be followed by, or be the result of, an upset in the carbohydrate metabolism. That such an upset does occur is indicated by the observation that an increase in the inorganic phosphorus of the blood is associated with the depletion in glucose, and the injection of glucose and insulin decreases the inorganic phosphorus. This altered metabolism of carbohydrates probably leads to the development of the hæmolytic agent and to a predisposition to hæmolysis and hæmoglobinuria. If this is so in monkeys, then it is conceivable how in some men, as a result of repeated attacks of malaria, the capacity of the body to utilize glucose in the normal way may be seriously altered, temporarily or permanently, and thus lead to a predisposition to blackwater fever.

The mere study of the glucose changes in the blood of blackwater fever cases may not indicate the extent of damage to carbohydrate metabolism and this may be the reason why such studies so far have not given any clue regarding any upset of the carbohydrate metabolism in man. That an upset of this metabolism does occur in man, as in the monkey, in the pre-hæmoglobinuric state is highly probable from other evidence as well. We believe that it is essential to consider this factor as being of far-reaching importance both in the ætiology and in the treatment of blackwater fever.

(e) *Alteration in inorganic phosphorus*.—The variations in inorganic phosphorus occurring in blackwater fever in man have been studied by a few investigators (Matko, 1918; Whitmore, 1928; Ross, 1932). Whitmore noticed an increase in this constituent but Ross obtained variable results. Matko advanced the view that alterations in phosphorus metabolism were responsible for hæmolysis, while Ross came to the conclusion that upsetting of the phosphorus metabolism was 'neither a preliminary to nor responsible for the intravascular hæmolysis'. The study of the alteration in this constituent in malarial hæmoglobinuria of monkeys (Krishnan and Pai, 1936) showed that there was a distinct tendency for the inorganic phosphorus to rise in the pre-hæmoglobinuric state in both splenectomized and non-splenectomized animals. In non-splenectomized monkeys not developing hæmoglobinuria, no such rise was noticed. This rise has been partly accounted for by these workers as being due to the rapid utilization of sugar through the hexose-phosphates of the corpuscles, and to the derangement of the carbohydrate metabolism. Their view appears to be

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although a condition of lowered bicarbonate reserve may be present in a certain percentage of blackwater cases, the change in the hydrogen-ion concentration is not enough to account for the hæmolysis. Recently, Ott (1932) has attempted to revive this fatty-acid theory on more or less hypothetical grounds.

In the case of monkey hæmoglobinuria Krishnan and Pai (1936) have obtained definite evidence of increased fatty-acid production (*vide supra*—rise in ester cholesterol and lecithin). Their work shows that in splenectomized monkeys, in which also the highest incidence of hæmoglobinuria occurs, the highest figures for cholesterol esters and lecithin were obtained. It is not known what the necessity for this abnormal and excessive production of fatty acid is; whether it is required for the parasite's growth and multiplication or for repair of damaged tissues or whether it is merely a by-product of altered metabolism, we cannot say. All the same it has been shown by these workers that associated with it the liver is damaged and the carbohydrate and fat metabolisms are upset. It can therefore be stated that so far as the monkeys are concerned hæmolytic unsaturated fatty acids are being produced in excess.

Some workers have opined that in monkeys the hæmoglobinuria being associated with an intense parasitization the hæmolysis can be explained on the basis of mere sporulation of the parasites. A closer study of the condition in these animals however has indicated that it would be necessary to assume here, as in man, that a hæmolytic agent is involved. The unsaturated fatty acids produced are more probably the agents of hæmolysis. In view of the high concentration of lecithin in the pre-hæmoglobinuric stage, it is even conceivable how hæmolytic substances like lyso-lecithin may be elaborated. The fact that the hæmolytic agent does not act when there is a sufficient amount of free cholesterol supports the view that unsaturated fatty acids or lyso-lecithin are probably the agents of hæmolysis. These acids we presume act not by virtue of their acid character but rather on account of their inherent hæmolytic properties. How far this fatty acid theory is applicable to blackwater fever cases in man it is too early to say. But we believe that it is the hæmolytic agent concerned in it as well. The beneficial results of alkaline therapy, glucose, choline hydrochloride, and cholesterol all lend support to this view.

Quinine hæmoglobinuria

Before concluding this article it seems essential to make a few remarks about the peculiar condition that is met with in certain cases of malaria and commonly classified under the term 'quinine hæmoglobinuria'. The existence of a number of such cases has given rise to the theory that improper drugging with quinine is responsible for the production of this condition.

The known facts relating to the condition are as follows:—The persons who generally develop it give a history of irregular and inefficient treatment with quinine. The condition is rare in those who have never taken quinine and also in those who have been properly treated with the drug. Administration of quinine even in minute doses precipitates an attack in these cases. It is however not known how the drug induces an attack of hæmoglobinuria or how it predisposes to it. That the drug does act as an excitant to hæmolysis and hæmoglobinuria in these cases, there is no doubt. The recent work of Nocht and Kikuth (1929) has shown that quinine *in vivo* favours hæmolysis and hæmoglobinuria when given with small doses of hæmolytic substances which in themselves are insufficient to produce either. This suggests probably that the agent responsible for the hæmolysis is not quinine itself but that the drug merely enhances the conditions favourable to hæmolysis already present. The processes of hæmolysis and hæmoglobinuria therefore do not seem to be different from those in the ordinary blackwater fever cases. If this view is correct then improper drugging with quinine merely acts as an adjunct to malaria in causing the damage which is an essential condition precedent to the onset of blackwater fever, and when the drug is administered later it elicits an abnormal response from the host and increases the chances of occurrence of hæmolysis and hæmoglobinuria. The work of Krishnan (1933) on the mode of action of quinine in malaria fully justifies such a hypothesis.

Conclusion

Taking all the evidence presented in the foregoing pages into consideration the following conclusion seems justifiable:—

Blackwater fever is not an independent disease but a manifestation of malaria. In its causation probably a special 'biological strain' of the malarial parasite is concerned. This strain is important not by virtue of its toxinogenic property but rather on account of its distinct biochemical activity. The peculiar mode of attack of the parasite on the host, for purposes of obtaining its food requirements, probably leads indirectly to the production of hæmolysis and hæmoglobinuria. This assumption recognizes the prime importance of the host factor not only in inducing this 'biological' variation in the parasite but also in producing the predisposition to hæmolysis and hæmoglobinuria. The two most important predisposing factors are a damaged reticulo-endothelial system and a diminution in free cholesterol involving both the red cells and the plasma, the latter determining the extent of hæmolysis and the former the degree of hæmoglobinuria. The sudden severe intravascular hæmolysis is explained not merely on the basis of physical alterations but rather by the presence of a hæmolysin. It is

suggested that this hæmolysin is the end result of a damaged liver and alterations in metabolism of both carbohydrates and fats, and that possibly it is of the nature of an unsaturated fatty acid or a lyso-lecithin.

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ATEBRIN-PLASMOCHIN IN THE TREATMENT OF MALARIA

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Introduction

THE advent of atebrian and plasmochin into the realm of the chemotherapeutics of malaria was hailed with acclaim on all sides and the pendulum of public opinion swung rapidly upwards in favour of these new rivals to quinine. The new drugs were seized on with avidity, both by the medical profession and by the general public who were only too eager to escape from the thralldom of quinine, till then the sovereign remedy, albeit a remedy which offered no royal road to the goal of the 'magna therapia sterilisans'.

Both drugs were exhibited, sometimes in wrong doses, and the inevitable result was the appearance of a crop of reports, some laudatory, some damnatory, and some with the doubtful Scotch verdict of 'not proven'. The pendulum had commenced its downward swing. Since that time much has been written on the therapeutic action of atebrian and plasmochin and the dosages, particularly of plasmochin, have been altered and readjusted as the result of trial and error. One fact has emerged from the mêlée, namely, that these drugs have real merit and have come to stay. The present article was written as the result of trials with atebrian and plasmochin in revised dosages with a view to obtaining the most satisfactory therapeutic action and the lowest relapse rates.

Types of treatment

By the courtesy of the manufacturers, Messrs. Bayer-Meister Lucius, the writer was furnished with a series of tablets, etc., for use in this investigation.

The following types of treatment were chosen for trial :

- (1) Combined tablet of atebrian 0.1 gramme with plasmochin 0.0033 gramme.

(Continued from previous column)

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(2) Combined tablet of atebirin 0.1 gramme with plasmochin 0.005 gramme.

(3) Atebrin tablet 0.1 gramme only.

(4) Atebrin-plasmochin dragées in same dosage as no. 1 but in keratinized capsules.

(5) Atebrin-plasmochin dragées in same dosage as no. 2 but in keratinized capsules.

(6) Atebrin musonate for injection, either intramuscularly or intravenously.

The object of the dragées was to determine whether the action of atebirin-plasmochin was interfered with in the stomach and whether possibly signs of intolerance or toxicity might be avoided when the drugs were liberated not in the stomach but in the bowel.

It was also proposed to note the action of the gastric juice in relation to the production of adverse symptoms and particularly the rôle of the gastric hydrochloric acid as a possible factor in cases which showed signs of intolerance or distress. Unfortunately the number of cases of abnormality in the gastric secretion met with in this experiment was limited to 5 cases in all and the results cannot be taken as definitely conclusive. Nevertheless these cases present some points of considerable interest.

In assessing the results of the various treatments, no cases are reported which have not been under observation for a minimum period of 6 months, and, in many instances, the period of observation is considerably longer.

No note was taken in these cases of the parasite densities in the peripheral blood as, in the experience of the writer, the intensity of infection has no relation either to the severity of the symptoms or to the relapse rate. As a matter of fact the smaller infections are often the most liable to relapse, either from lack of sufficient treatment or from the smaller degree of immunity resulting from the attack. In other words, the defensive mechanism is not roused to activity. It has also been the experience of the writer that cases of malaria with very few parasites in the peripheral blood often present more urgent symptoms of gastric distress, cerebral complications, or the asthenic type of malaria with grave algid symptoms.

James classifies the return of malaria after a primary attack in three categories:—

(A) *Recrudescence*.—A return of fever and parasites within 8 weeks of recovery.

(B) *Relapse*.—A return of fever and parasites between 8 and 24 weeks after recovery.

(C) *Recurrence*.—A return of fever and parasites at some time later than 24 weeks.

For clinical purposes there is no advantage in separating up recrudescence and relapse as specified above, and, in the tables printed below, this distinction is not made and all cases which showed fever and parasites within six months are classified as relapses.

It should be noted here that the area from which these cases were taken has been under anti-larval control for three years and that the

small number recorded represents the bulk of the malaria cases admitted to hospital for a period of 9 months. Thus, whilst reinfection cannot be entirely eliminated in assessing the relapse rates, this factor is not likely to be potent enough to vitiate the results. The population of the area from which these patients were received is roughly 25,000 and the area about 50 square miles.

All cases were treated in hospital and were kept under observation for not less than 7 days, during which time the blood was examined daily. On leaving hospital, a record was kept of all these admissions for 6 months, and every case was seen at least once weekly.

The results of treatment and the relapse rates are shown in table I.

Blood films (thick and thin) were taken daily in each case and the types of infection noted. The times of disappearance of parasites from the peripheral blood are noted in table II. Slides in every case were taken on completion of the day's treatment, so that, on the first day for example, each patient had 3 tablets before his blood was examined, and so on for each day. The table therefore shows the results obtained after 24 hours, 48 hours, etc., of the particular treatment specified.

A comparison of combined treatment with atebirin-plasmochin and atebirin alone shows that the combined treatment seems definitely to shorten the period of pyrexia by roughly one day on the average.

From the table it will be seen that there is little to choose between the four methods of treatment with combined atebirin and plasmochin, but that when atebirin alone is administered there is a definite prolongation of the life of parasites in the peripheral blood; this is if anything more marked in the case of atebirin musonate. Atebrin musonate was given in two doses of 0.250 gramme each, injected intramuscularly on successive days. The addition of plasmochin appears to shorten the time of persistence of the parasite in the peripheral blood.

In administering atebirin musonate, care must be taken to prepare the solution in the dark and also to keep the patient away from light as far as possible, following the injections. Unless precautions are taken, the drug exhibits some undesirable effects due to photo-synthetic action. If proper precautions are taken, no untoward symptoms arise.

Toxicity

A considerable literature has accrued on the subject of toxic symptoms following the administration of atebirin-plasmochin. A careful analysis of cases reported will show that these effects have often followed treatment carried out without proper control and often in patients not under hospital supervision.

There has also been a tendency to attribute symptoms which are due to malaria itself to

TABLE I

Treatment	MALIGNANT TERTIAN			BENIGN TERTIAN			TOTAL		
	Cases	Relapse	Per cent	Cases	Relapse	Per cent	Number of cases treated	Number of relapses	Rate of relapse, per cent
Atebrin only, 0.1 gramme, t.d.s., for 5 days.	21	3	14.29	5	1	20.0	26	4	15.38
Atebrin 0.1 gramme and plasmochin 0.0033 gramme, t.d.s., for 5 days.	23	2	8.7	8	1	12.5	32 *	3	9.38
Atebrin 0.1 gramme + plasmochin 0.005 gramme, t.d.s., for 5 days.	27	3	11.1	4	1	25.0	32 †	4	12.5
Atebrin musonate injection 0.250 gramme on two consecutive days.	4	..	..	..	..	..	5 ‡	1	20.0
Atebrin dragées.									
Atebrin 0.1 gramme + plasmochin 0.0033 gramme, t.d.s., for 5 days.	4	..	..	..	..	..	4	..	..
Atebrin, 0.1 gramme + plasmochin, 0.005 gramme t.d.s., for 5 days.	6	..	..	1	..	..	7	..	..
TOTAL ..	85	8	9.4	18	3	16.6	106	12	11.32

* Including one quartan case in which there was no relapse.

† Including one mixed infection case in which there was no relapse.

‡ Including one quartan case in which a relapse occurred.

the drugs administered. Symptoms arising from intercurrent disease have also to be excluded in estimating the effects of atebriin-plasmochin treatment. Green (1934) reports a case which developed epileptiform fits twenty days after treatment with atebriin. The patient, on questioning, admitted that he had had similar fits since childhood.

Again, abdominal pain and gastric tenderness are both common concomitants of a malaria attack and are independent of the drugs exhibited. Headache also is common in malaria and degrees of cerebral disturbance are met with in every severe attack.

In the present series of cases, adverse symptoms were surprisingly few. Three cases showed transient yellowish discoloration of the skin, associated with constipation.

Tropp and Weise (1933) have shown by colorimetric observations that atebriin is excreted in equal quantities in the stools and urine, and that the excreted pigment physically and biologically is identical with atebriin. If care is taken to prevent constipation and to promote diuresis by the plentiful use of fluids during the febrile period, yellow discoloration of the skin seldom occurs.

Hecht (1933) has shown that atebriin does not bring about the formation of methæmoglobin either *in vitro* or *in vivo*, and that the drug does not cause hæmolysis.

In the 106 cases reported in this paper, five only exhibited signs of intolerance. In these

five cases, gastric analysis showed abnormality in the secretion of HCl. Two cases showed hyperchlorhydria and three showed complete achlorhydria.

Case I.—Persistent hyperchlorhydria with subsequent development of gastric ulcer. This case developed benign tertian malaria and on completion of a five days' course of atebriin 0.1 gramme and plasmochin 0.005 gramme developed tachycardia, substernal tenderness and transient blueness of the lips and finger nails. The symptoms subsided quickly after cessation of treatment and the use of glucose by mouth.

Case II.—Benign tertian malaria and hyperchlorhydria. Completed the course of atebriin 0.1 gramme + plasmochin 0.005 g., t.d.s., but developed marked yellowness of the skin, tachycardia and slight abdominal pain. The symptoms, excepting the yellowness of the skin, subsided rapidly.

The subsequent history of this case is interesting. She relapsed and developed benign tertian malaria five months later. On my advice, she took atebriin 0.1 gramme with plasmochin 0.005 gramme in dragées. There were no symptoms of intolerance and there has been no further relapse within one year of treatment.

These two cases would seem to indicate that the presence of excessive hydrochloric acid was a possible factor in determining the symptomatology.

The experiments of N. D. Kehar (1935) seem to indicate that atebriin excretion, when the drug is administered on an empty stomach or 2½ hours after a meal, is greater than at, or within 2 hours of, a meal. This might also indicate a possible connection between the pH of the gastric juice and the absorption or retention of atebriin in the system.

Case III.—Achlorhydria. No free hydrochloric acid in gastric juice. Developed malignant tertian malaria. Treatment—atebriin 0.1 gramme + plasmochin 0.0033 gramme, t.d.s., in combined tablet. Blood negative on second day. On third day of treatment, patient complained of dyspnœa, pain in precordial region and

epigastric tenderness. Epigastric pain and tenderness persisted for days. The course of treatment was omitted on the fourth day and resumed on the fifth day with two tablets only daily.

Case IV.—Malignant tertian malaria—hæmoglobin 35 per cent (Hellige). Gastric juice showed no free hydrochloric acid. Treatment—atebrin 0.1 g. + plasmochin 0.0033 gramme, t.d.s. The patient complained of severe epigastric pain, nausea and vertigo on first day which persisted on second day. Treatment was stopped on second day but resumed on third day with atebrin 0.1 gramme + plasmochin 0.0033 g. in dragée, t.d.s. There was no further complaint of epigastric pain. Temperature was normal on fourth day. Blood positive until fourth day.

Case V.—Quartan malaria with nephritis, admitted on 23rd December, 1934. Gastric juice showed no free hydrochloric acid. The patient was pregnant. Treated with atebrin musonate 0.250 gramme intramuscularly on two successive days. Blood negative on second day. Patient complained of precordial distress and vertigo with epigastric tenderness. She aborted on the third day. Blood negative for next two weeks. Patient remained in hospital under treatment but relapsed on 14th February, 1935. Blood showed quartan malaria. She was treated with atebrin 0.1 g. + plasmochin 0.0033 gramme in dragée and had no complaint. Blood negative on seventh day.

In addition to these cases, two other cases, which are not included in this series, are of correlated interest :

Case A.—Female with complete achlorhydria and cholecystitis, treated for malignant tertian malaria, with atebrin 0.1 g. and plasmochin 1/6th grain daily. Developed signs of intolerance with gastric and abdominal pain and cardiac distress, and vomiting on second day. Subsequently given quinine.

Case B.—Female. Gastric secretion normal. X-rayed for bilious attacks. Well marked cholecystitis. She developed malignant tertian malaria and was treated with atebrin-plasmochin. The dose given was atebrin 0.1 gramme in tablet form. To this was added plasmochin 1/6th grain daily on the second day of treatment. She developed signs of intolerance after 24 hours with severe gastric pain, tenderness on the liver and headache. Blood negative on second day. This patient has since been operated on for cholecystitis.

These two latter cases are not included in the 106 cases recorded in the above series, but are noted as they seem to bear on the five cases reported above.

From the evidence of these cases, there seems to be a definite connection between achlorhydria, the biliary system, and the production of toxic symptoms after the exhibition of atebrin and plasmochin.

It seems logical to conclude that the symptoms of intolerance in these cases after the administration of these drugs were due to abnormality of the gastric juice alone or accompanied by pathological changes in the gall-bladder.

In none of the remaining 101 cases were any untoward symptoms evolved.

Hecht has shown by making use of the fluorescent effect of atebrin under the influence of ultra-violet rays, in experiments on mice, that atebrin is retained markedly in the gall-bladder and less markedly in the bowel and liver.

It seems reasonable to infer that such retention may cause the production of toxic symptoms when the gall-bladder is already the seat of pathological changes with deficiency or slow excretion of bile. It seems also a reasonable inference that, in normal individuals, the exhibition of atebrin and plasmochin in the doses devised for these experiments is perfectly safe and not likely to produce any toxic symptoms.

The scope of this paper does not permit any evaluation of the parts played by atebrin and by plasmochin or which of the two assumes the leading rôle. In the doses used, it is clear that plasmochin is well tolerated.

The effects of treatment

The results show a relapse rate of 11.32 per cent within 6 months. This rate compares very favourably with the relapse rate of quinine-treated cases. The relapse rate with quinine in a series of 200 cases treated on three gardens during 1930-31 was 40 per cent. Not only is the relapse rate reduced from 40 per cent with quinine to 11 per cent with atebrin-plasmochin, but the bulk of the patients infinitely prefer the atebrin-plasmochin treatment to quinine, in whatever form. The period of treatment is also much shorter and this is a factor of considerable commercial value.

A comparison of treatment in table II shows that the combined treatment is better than atebrin alone.

Regarding the combined treatment, the results obtained by atebrin-plasmochin in dragées are better than with the combined tablet, and toxic symptoms are avoided. There is nothing to

TABLE II
Atebrin and plasmochin (all types of treatment)
Showing first day in which blood film was negative

	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	Total cases	Average duration, days
In M. T. cases	20	28	8	3	1	..	..	60	2.0
In B. T. cases	8	3	1	1	..	..	..	13	1.7
In quartan cases .. ..	..	..	..	1	..	..	..	1	4.0
In M. T. and B. T. cases .. ..	..	..	1	..	..	..	..	1	3.0
TOTAL ..	28	31	10	5	1	..	..	75	2.0

TABLE IIa
Atebrin alone

		1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	Total cases	Average duration, days
Atebrin by mouth.	In M. T. cases ..	2	9	5	..	5	..	..	21	2.85
	In B. T. cases ..	..	..	2	..	1	1	1	5	4.8
TOTAL ..		2	9	7	..	6	1	1	26	2.32
Musonate by injections.	In M. T. cases ..	1	1	..	1	..	..	1	4	3.5
	In quartan cases	..	..	1	..	..	..	..	1	3.0
TOTAL ..		1	1	1	1	..	..	1	5	3.40
Either form		3	10	8	1	6	1	2	31	3.26

TABLE IIb
Atebrin and plasmochin

		1st day	2nd day	3rd day	4th day	5th day	6th day	7th day	Total cases	Average duration, days
Atebrin 0.1 g. + plasmochin 0.0033 g.	In M. T. cases ..	9	10	3	..	1	..	..	23	1.9
	In B. T. cases ..	4	2	1	1	..	..	..	8	1.9
	In quartan cases	..	..	..	1	..	..	..	1	4.0
TOTAL ..		13	12	4	2	1	..	..	32	1.9
Atebrin 0.1 g. + plasmochin 0.005 g.	In M. T. cases ..	8	13	5	1	..	..	..	27	2.0
	In B. T. cases ..	3	1	..	..	..	..	..	4	1.2
	In M. T. and B. T.	..	..	1	..	..	..	..	1	3.0
TOTAL ..		11	14	6	1	..	..	..	32	1.9
Atebrin 0.1 g. + plasmochin 0.0033 g. (dragées).		..	3	..	1	..	..	..	4	2.5
TOTAL ..		..	3	..	1	..	..	..	4	2.5
Atebrin 0.1 g. + plasmochin 0.005 g. (dragées).	In M. T. cases ..	3	2	..	1	..	..	..	6	1.8
	In B. T. cases ..	1	..	..	..	..	..	..	1	1.0
TOTAL ..		4	2	..	1	..	..	..	7	1.7

choose between the two doses of plasmochin so far as results go.

Duration of fever

The average duration of fever in these cases was closely correlated to the presence of malarial parasites in the peripheral blood, and fever usually abated when the blood was negative.

In a few cases fever persisted for about twelve hours after the peripheral blood was negative. The average duration of fever was therefore about 48 to 60 hours.

Treatment of relapses

Relapses were treated with atebirin 0.1 gramme + plasmochin 0.005 gramme, t.d.s., for

5 days. Treatment was omitted for the next 3 days, and a subsequent treatment of atebirin alone for 3 days given, the dose being 0.1 gramme, t.d.s. The blood is examined daily during this course. Blood is examined on completion of the second short treatment. The patient is then put on quinine gr. x daily at night for 10 days. At the end of the period, the blood is re-examined and, if negative, atebirin alone, 0.1 g., t.d.s., is given for 3 days. This completes the treatment. So far none of the cases so treated has relapsed. The treatment is designed to anticipate the possibility of relapse about the beginning of the third week after the initial attack.

Atebrin musonate

Only 5 cases were treated in this series with a relapse rate of 20 per cent. Two injections only were used on consecutive days. Some modification of this treatment would seem to be essential and more extensive trial is necessary before any conclusions can be drawn.

Summary

Atebrin-plasmochin in combined tablet and in dragées and atebirin musonate in the various doses were tried in a series of 106 cases. The relapse rate was 11.32 per cent. Excluding the atebirin musonate series in which one out of five cases relapsed and the atebirin only series in which the relapse rate was 15.38 per cent, the relapse rate with atebirin-plasmochin combinations was 9.33 per cent.

The small difference in the dose of plasmochin in the combined tablets or dragées had no appreciable influence on the results.

Toxic symptoms in this series were limited to cases which showed excess or deficiency of gastric hydrochloric acid or pathological changes in the gall-bladder. No toxic symptoms were noted in normally healthy patients. The percentage of cases showing toxic symptoms was 4.7. Atebrin-plasmochin in dragées form was successfully exhibited where the ordinary tablets caused epigastric distress. This bears out the relation of the gastric pH to the production of toxic symptoms.

A scheme for the treatment of relapse is outlined.

Conclusions

Atebrin 0.1 gramme with plasmochin 0.0033 or 0.005 gramme given in dragées is the best treatment for malaria at present available, with the lowest relapse rate.

Atebrin musonate requires further trial before a definite conclusion can be arrived at. The dosage is probably insufficient.

Atebrin-plasmochin dragées are least likely to cause symptoms of intolerance, even in the presence of gastric or biliary disease. No relapses occurred in the series, in which dragées were used.

(Continued at foot of next column)

MASS TREATMENT WITH INJECTABLE ATEBRIN

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IN the course of experiments conducted at the Colombo General Hospital during the malaria epidemic in Ceylon with atebirin-dimethylsulphonate (musonate) a method was elaborated by which it became possible to effectively treat severe cases of malaria with two injections given at an interval of 24 hours without any other additional treatment (Blaze and Simeons, 1935).

The results obtained in these experiments showed that it is possible to exercise a very rapid and lasting effect on a malaria infection by this particularly simple method. Although it is usually possible to cure a case of malaria with oral atebirin only, it is obviously a great advantage to have a simple, effective and quick treatment in certain cases. Apart from those very severe cases where quick results are urgently required this method would seem to have particular and hitherto unrealized advantages for conducting a 'blanket treatment'. It was therefore desirable to continue my experiments on a larger scale under well-controlled conditions permitting exact observation.

'Blanket treatment' of hospital staff

For this purpose the staff of the Kurunegalle Hospital was selected. Kurunegalle is a provincial town in Ceylon situated in one of the worst epidemic centres. The hospital staff consists of 65 persons, practically all of whom had had malaria within the last two months. Thirty-eight were actually suffering from clinical symptoms at the time and on an average there was a daily absence of about 20 per cent, in spite of the fact that nearly all were taking quinine or quinoplasmochin in varying doses. Twenty-eight persons had enlarged spleens and 36 blood slides were found to contain parasites

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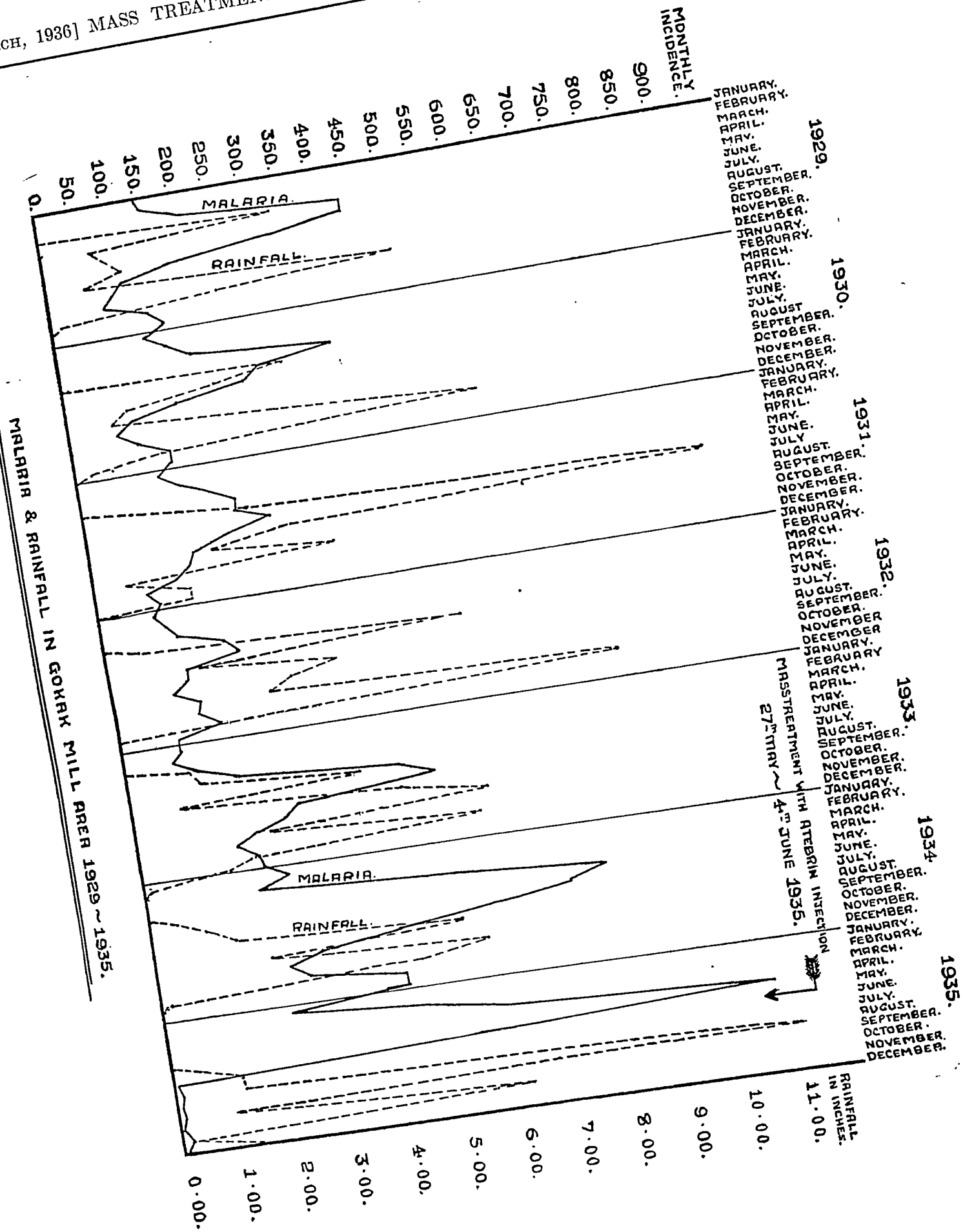
Acknowledgments

The writer thanks Dr. A. Brocke, Ph.D., of Bayer-Meister Lucius for supplying the drugs for these experiments.

He also acknowledges the assistance of Dr. L. R. Dey and the staff of the Cinnamara Central Laboratory for their help in the compilation of the tables.

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MALARIA & RAINFALL IN GOKAK MILL AREA 1929 ~ 1935.

(22 malignant tertian, 11 benign tertian and 3 malignant tertian *plus* benign tertian mixed infections). The staff was requested to take no medicine for 24 hours and every person was then given an intramuscular injection of 0.3 g. injectable atebirin (musonate) dissolved in 9 c.c. of sterile distilled water. The same injection was repeated on the following day and the staff was instructed to take no further medicine.

The blood of every person was re-examined three days after the last injection. In one case 2 degenerated benign tertian parasites were found in a thick film; not a single healthy parasite was seen in any of the slides. Every slide was independently studied by two observers.

After the first injection two sisters complained of a slight feeling of giddiness and one doctor vomited. No other unpleasant symptoms were observed. In fact nearly all the patients spontaneously expressed a distinct feeling of well-being after the second injection. In every case the injection itself proved absolutely painless, two or three persons however complained of a slight tenderness some time after the injection. Routine work was continued without any interruption before and after the injection. No case of fever attributable to malaria was observed during the following 5 weeks in spite of the fact that the possibility of reinfection could not be excluded. Six weeks later 6 cases of malaria were observed: (malignant tertian 2, benign tertian 4). During an epidemic it is of course impossible to say whether these were relapses or reinfections.

This experiment proved the suitability of parenteral treatment under working conditions in a well-controlled group of persons.

Mass treatment in an isolated village

The next step was to find out whether this method could be used under field conditions in an uncontrolled population. For this purpose a small isolated village with about 250 inhabitants in the Kurunegalle district was selected, the death rate in that village being the highest in the whole area (60 registered deaths in two months).

One hundred and forty-six blood slides were examined of which 58 (39.72 per cent) were found positive (benign tertian 17, malignant tertian 37, benign tertian *plus* malignant tertian 4). Every inhabitant received 2 injections, 24 hours apart, of injectable atebirin (0.3 g. in 9 c.c. water). Children were given 1 c.c. of the solution per year of age up to 8 years; children above 8 years receiving the full dose.

One week later 124 blood slides were taken from persons previously injected of which 6 were found to be positive (4.5 per cent) (benign tertian 4, malignant tertian 2). Not a single inhabitant complained of having had any fever at all during this week. The population was carefully controlled over a period of 6 weeks during which time 7.6 per cent of the treated

persons complained of having had fever. Here again it was obviously impossible to distinguish between relapses and reinfections.

The whole treatment was carried out in 3 days. The general condition of the inhabitants before treatment was extremely bad through continued fever and famine but improved remarkably immediately afterwards. Two small children, 2 and 4 years of age, were suffering from cerebral malaria, were unconscious and having convulsions. As their condition seemed hopeless, the risk of injecting was taken. One child died in a collapse about 20 minutes later, the other child vomited but made a complete recovery in 48 hours. In 3 other children vomiting and giddiness were observed; these symptoms, however, passed off in a few minutes leaving no undesirable after-effects. Those persons injected on the first day felt so much better that no difficulty was encountered in administering further injections.

The above-mentioned toxic effects in children induced the medical authorities of Ceylon to pronounce injectable atebirin unsuitable for mass treatment in an under-nourished population. Further experiments on this line were therefore broken off, the atebirin musonate treatment being reserved for special cases only.

Mass treatment in a mill area

An opportunity for further experiments in mass treatment was however offered by a Bombay firm who, having heard of the work in Ceylon, were prepared to carry all expenses for a 'blanket' treatment in one of their mills with a very heavy incidence of malaria.

A preliminary survey of the malaria at the Gokak mills in the Southern Mahratta country showed ideal conditions for conducting a carefully-controlled experiment. The mill is situated on the bank of a river and includes a village for mill-hands with a total population of about 5,600 souls. There are no other villages within a radius of about 3 miles of the mill area. All illness occurring in the village is treated in the mill hospital by a resident medical officer and careful records are kept. The carrier is *Anopheles culicifacies* which breeds in the river bed (no other breeding places were found in the vicinity). The chart shows the monthly incidence of malaria for the last 7 years in relation to the monthly rainfall. From the chart it can be seen that during the years 1926 to 1932 there is an increase in yearly rainfall and a decrease in malaria incidence. After 1932 the yearly rainfall drops or sets in late while the malaria incidence rises. Owing to a long drought from November 1934 to May 1935 there is an unusually high malaria peak, reaching 880 cases in the month of April.

After one week of careful oiling of all breeding places in the river bed, a blanket treatment of the whole population was started on the 27th of May 1935. Five thousand six hundred

and fifty people were treated (11,300 injections). This work was completed within 9 days with the help of two assistants. As it was intended to show that this method can be carried out in a minimum of time with negligible overhead expenses neither parasite rate nor spleen index were recorded. Every person in the mill area was treated including infants, pregnant women and persons suffering from other diseases.

The dosage of each injection (24 hours apart) was as follows:—

Strong and healthy adult males 9 c.c. (0.3 g. atebtrin).

Strong and healthy adult females 8 c.c.

Weak or unhealthy adult males 8 c.c.

" " " " females 7 c.c.

In the case of children dosage was not given according to stated age but rather according to general appearance approximately as follows—

Infants appearing to be below 6 months $\frac{1}{2}$ c.c.

Above 6 months and up to 2 years 1 c.c.

2 to 4 " 2 c.c.

4 " 6 " 3 c.c.

6 " 10 " 4 c.c.

10 " 12 " 5 c.c.

12 " 15 " 6 c.c.

15 " 18 " 7 c.c.

A small dose of magnesium sulphate was given to every person before the first injection.

After the second injection every patient was given 3 tablets of 0.02 g. plasmochin simplex (children correspondingly less) and instructed to take one tablet on three consecutive days beginning on the day after the second injection.

The only toxic symptoms observed after the injection of atebtrin were a slight giddiness in about 1 per cent of the cases and three cases of fainting, none of which were serious. No mental derangement of any kind was observed.

The percentage of persons complaining of giddiness after the injection was slightly higher in those injected in the afternoon than in those that received their injection early in the morning. This seemed to suggest that the injected solution which was prepared in large quantities in the morning gradually deteriorated during the day. In order to get some more definite information on this point 500 doses were prepared one evening, kept overnight and injected the following morning. Out of this batch about 50 to 60 persons complained of giddiness within the next 5 or 6 hours. It was therefore decided to prepare smaller quantities of solution at a time and to discard any solution that could not be used at once. From then on out of about 3,500 injections only one case of giddiness was observed.

Since these observations Hecht has informed me that he has carried out pharmacological experiments which definitely show that no toxic

substances are formed when atebtrin-dimethylsulphonate solution is submitted to severe stability tests; it deteriorates only very gradually under normal conditions. Whatever the explanation of my observation may be the fact that the manufacturers put up the preparation in dry ampoules seems to emphasize the importance of using only freshly prepared solutions.

During the first half of the treatment the refilling of the syringe was done by means of a rubber tube from a bottle containing the solution attached to an adaptor with a three-way cock fitted to the syringe. In this way it was possible to refill the syringe rapidly under perfectly aseptic conditions. About half-way through the work, however, these adaptors began to leak and it became necessary to immerse the syringe into the solution for refilling, not a strictly aseptic procedure. The result was that whereas among patients injected with the adaptor no abscesses occurred, 49 cases of abscesses, mostly in young children and old and feeble adults, were observed among those injected during the latter part of the treatment. As it is known (Hicks, 1935) that the injection does not give rise to necrosis, I am inclined to believe that these abscesses were due to an unsatisfactory asepsis rather than to the injection itself.

The only serious incident was hæmoglobinuria occurring on the day after the last tablet of plasmochin (4 days after the second injection). In all, 4 cases were observed, 2 severe cases ending fatally and 2 mild cases. All 4 patients were Mohammedans, 3 belonging to the same household and all four natives of the same village situated a few miles further up the river, but all at the time residing in the mill area. All were taking treatment from a local physician for syphilis.

The two fatal cases were known to have been suffering from syphilis. The two mild cases, young brothers, believed that they were suffering from 'venereal disease', but had no specific history. All had previously suffered from malaria but were quite free of clinical symptoms at the time of treatment. The cases resembled in every respect those observed and described by Amy (1934) in the North-West Frontier Province of India. It is most unfortunate that laboratory facilities were not available for a detailed study of my cases. Of the two fatal cases one, a young man, died in 48 hours, the other made an apparently complete recovery but left hospital against orders and died 2 days later in his house of heart failure, an occurrence not uncommon in true blackwater fever.

There is nothing to suggest that these cases had anything to do with the atebtrin (Chopra, Sen and Bhattacharya, 1935). They appear to be in some way connected with plasmochin. Perhaps the fact that all four were taking medicine (mercury?) may help to throw some light on this perplexing problem, although I

have received a private communication from Col. Amy that there was not even a suspicion of syphilis in any of his cases.

Except one not quite typical case described by Lindberg (1935) blackwater fever as such is unknown in the Gokak district.

Immediately after the mass treatment, not a single case of malaria was observed. Through the carefully conducted anti-larval campaign I tried to exclude as far as possible a reinfection after the mass treatment so that all cases of fever occurring after treatment could be registered as relapses.

In spite of the fact that an occasional reinfection may have been included among the registered relapses, the figures, as can be seen from the chart, are surprisingly low considering the fact that no quinine or other anti-malarial remedy has been dispensed during the 7 months of observation. The total numbers of malaria cases for each month after the blanket treatment are as follows:—

June	..	..	2
July	..	..	10
August	..	..	5
September	..	..	9
October	..	..	6
November	..	..	15
December	..	..	8

Every relapse has been immediately treated with 2 injections and the villagers (after extensive propaganda) seem to have realized the importance of bringing every fever case for treatment so as to prevent a further spread.

Discussion

The first experiment (Kurunegalle Hospital) shows that my method, *i.e.*, the treatment of a case of malaria with two injections of atebtrin-dimethylsulphonate at an interval of 24 hours, is practicable without interference with the routine work of the treated person. The two field experiments, one in the Ceylon village and the other at Gokak, show that my method is particularly suitable for blanket treatment and it therefore appears to be a useful addition to our therapeutic armament.

The method was originally devised for the treatment of the actual acute malaria attack. In this respect I am inclined to consider the results satisfactory.

It is only from the Gokak experiment that we can gather some information regarding the relapse rate after this abbreviated treatment. Here too I am inclined to consider the results better than were to be expected considering the very small quantity of atebtrin given. I am, however, not surprised by the fact that other authors have found a higher relapse rate after two injections of atebtrin musonate, as it must be borne in mind that my experiments were all conducted in highly endemic areas during a particularly high incidence. We must presume

that the population in these areas had already acquired a considerable degree of immunity and that therefore very small doses of atebtrin were sufficient to produce good and lasting results. On the other hand when dealing with first infections it will probably be necessary to give a longer treatment in order to prevent relapses and achieve a permanent cure, be it by an oral after-treatment or further injections at longer intervals.

Summary

(1) A hospital staff of 65 persons received two injections of atebtrin-dimethylsulphonate at an interval of 24 hours. Parasites and fever were completely controlled in 3 days. No further malaria fever was observed during the following 5 weeks. No serious toxic symptoms were observed.

(2) During a malaria epidemic in a village in Ceylon, all inhabitants including children (240 persons) were treated with two injections. Every person so treated was free from clinical symptoms of malaria during the following week. Before injection the parasite rate was 39.72 per cent; one week after injection the parasite rate was 4.5 per cent. During the next 6 weeks 7.6 per cent of the population complained of having had fever. The general condition of patients very considerably improved immediately after treatment.

(3) In a mill area blanket treatment of 5,650 persons with two injections was completed in 9 days. Solution more than a few hours old produced giddiness in a small percentage of persons and very occasionally fainting. The former symptom was only observed in one case with fresh solution. Forty-nine abscesses in small children and weak adults are ascribed to unsatisfactory asepsis and not to the injection as such. Four cases of hæmoglobinuria after plasmochin are observed in patients who are receiving anti-syphilitic treatment from a hakim. A possible connection between syphilis, mercury, plasmochin and hæmoglobinuria is suggested. During the 7 months a total of 55 relapses was observed, and treated with two injections as before.

Acknowledgments

My thanks are due to the medical authorities in Ceylon for permitting preliminary experiments and to Messrs. Forbes, Forbes, Campbell and Company, Bombay, for their support and help in carrying out the mass treatment at Gokak.

To Dr. Malshett, the resident medical officer at Gokak, and to my assistants Doctors Devasahayan and Swamidass for their enthusiastic co-operation.

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RHEUMATIC HEART DISEASE IN THE BOMBAY DECCAN

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THE conception that rheumatic fever and its concomitants are rare or entirely unknown within the true tropics has long been in favour. Seemingly it received strong confirmation when Clarke (1930) published his notable paper on the geographical distribution of rheumatic fever. Rogers and Megaw (1930) in India and Swift (1931) and Longcope (1931) in America have supported this view. However, in the same year that Clarke published his paper, Hughes and Yusuf (1930) reported 25 cases of heart disease of rheumatic origin from Lahore, while Stott (1930) at Lucknow reported 20 cases of mitral stenosis. Two years later, Hodge (1932) reported six cases of rheumatic disease from Jalpaiguri, Bengal. Nevertheless, in each of these cases the objection can be made that they were not from within the true tropics. More recently, Kutumbiah (1935) from Vizagapatam and Banerjee (1935) from Calcutta have published series of cases of rheumatic heart disease to which this objection cannot be taken. It is our purpose to help further to clarify this subject by reporting our experience at Miraj.

Miraj is situated in the Bombay Deccan, 160 miles south of Poona at an elevation of about 1,800 feet and well within the true tropics. The Presbyterian Mission Hospital is an institution of 270 beds caring for about 5,500 outpatients and approximately 3,200 inpatients yearly, the majority of the latter, namely 70 per cent, being surgical. In the period under discussion, from 1st November, 1933, until 1st November, 1935, there were 6,248 admissions to the hospital, 4,281 (68.52 per cent) being surgical and 1,967 (31.48 per cent) being medical. During this period of time there were 100 cases of cardiac disease admitted, distributed according to diagnosis as shown in table I. These formed 1.60 per cent of the total admissions and 5.08 per cent of the medical admissions. In this group there were 47 cases of rheumatic origin, forming 0.75 per cent of the total admissions and 2.44 per cent of the medical admissions. In reference to the temperate climates, Tice (1920) states that about 5 per cent of all patients met

with in general practice have chronic valvular disease of the heart and Davis and Weiss (1931) have found that rheumatic heart disease made up 9.1 per cent of 5,215 autopsies performed in Boston. Although there seem to be no statistics for the incidence of rheumatic heart disease in hospital practice in the temperate zones that

TABLE I

(Terminology according to the Standard Classified Nomenclature of Disease, Amer. Med. Assoc., 1935)	
Hypertensive heart disease ..	11 (11 per cent)
Unclassified ..	2
Hypertension of the greater circulation ..	6
Hypertension of the lesser circulation ..	0
With emphysema ..	3
Arteriosclerotic heart disease ..	28 (28 per cent)
Sclerosis of the coronary arteries ..	27
Coronary thrombosis ..	1
Syphilitic heart disease ..	10 (10 per cent)
Unclassified ..	1
Aortic regurgitation ..	3
Syphilitic aortitis ..	2
Aneurysm of the aorta ..	4
Subacute bacterial endocarditis ..	4 (4 per cent)
Rheumatic heart disease, inactive ..	25 (25 per cent)
Mitral regurgitation ..	4
Mitral stenosis ..	4
Mitral stenosis and mitral regurgitation ..	6
Mitral stenosis and regurgitation with aortic regurgitation ..	1
Mitral stenosis and regurgitation with aortic stenosis ..	1
Mitral stenosis and regurgitation with tricuspid regurgitation ..	1
Mitral stenosis with tricuspid regurgitation ..	1
Mitral stenosis with aortic stenosis and tricuspid regurgitation ..	1
Sclerosis of the mitral valve ..	2
Sclerosis of the mitral, aortic and tricuspid valves ..	1
Sclerosis of the mitral and tricuspid valves ..	1
Sclerosis of the tricuspid valve ..	1
Sclerosis of the mitral and aortic valves with adherent pericardium ..	1
Rheumatic heart disease, active ..	22 (22 per cent)
Mitral regurgitation ..	4
Mitral stenosis ..	9
Mitral stenosis and regurgitation ..	2
Mitral stenosis and regurgitation with aortic stenosis and regurgitation ..	1
Mitral stenosis and regurgitation with tricuspid regurgitation ..	2
Mitral stenosis and aortic regurgitation ..	1
Mitral stenosis and regurgitation with aortic regurgitation ..	1
Mitral stenosis and tricuspid regurgitation ..	1
Sclerosis of the mitral, aortic and tricuspid valves with adherent pericardium ..	1

(Continued from previous page)

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Note.—Among the rheumatic hearts, paroxysmal auricular fibrillation and chronic auricular fibrillation were each seen twice.

are strictly comparable with those herewith presented, nevertheless there seems to be little doubt, in the present state of our knowledge, that the condition is much less prevalent in the Bombay Deccan.

Discussion

The greatest difficulty in classification was experienced in the arteriosclerotic-hypertensive group of cases. In general, it may be said that we have put all cases showing a marked degree of peripheral arteriosclerosis, a well-marked aortic sclerosis or cardiac pain in the arteriosclerotic group. Those cases that showed a persistent hypertension without marked vessel sclerosis were considered as purely hypertensive while those cases that showed neither hypertension nor arteriosclerosis but were associated with pulmonary emphysema were classified as such. In this way, we were able to classify 11 per cent of our cases as hypertensive and 28 per cent as arteriosclerotic. As Fahr (1935) remarks, 'there is often considerable doubt as to whether a case should be filed as a hypertension heart or as coronary disease and the final decision is somewhat arbitrary'. Further the part played by the pulmonary factor is often difficult to assess in many cases. Maher *et al.* (1935) found 26.2 per cent of their cases in the Chicago area to be hypertensive and 24.1 per cent to be arteriosclerotic. These figures do not include their pulmonary cases which formed an additional 5.8 per cent. These three formed 56.1 per cent of their total cases as compared with our 39 per cent. Comparison of our percentages with these and other figures is shown in table II. It will be noted that we report having seen no case of congenital heart disease nor of thyroid heart disease in this present series. Maher *et al.*, on the other hand, reported 0.6 per cent and 10 per cent respectively for these types.

In considering our cases of rheumatic heart disease with which we are primarily concerned in this paper, we note that they made up 47 per cent of our 100 cases as compared with 43.2 per cent of the series reported by Kutumbiah from

TABLE II

	Miraj	Cabot (Boston)	White and Jones (Boston)	Maher <i>et al.</i> (Chicago).	Perry (England)
Rheumatic	47.0	32.0	30.0	29.2	38.4
Senescent	39.0	60.0	57.3	56.1	31.8
Syphilitic	10.0	7.0	2.9	0.97	6.5

Vizagapatam and 33.2 per cent of that reported by Banerjea from Calcutta. Of these 47 cases of rheumatic heart disease, eleven were females

and 36 were males. Torrey (Tice, 1920) states that the total incidence of rheumatic fever in males and females probably does not present any great differences, records from private sources being much more trustworthy on this point than are the history records from hospitals. Females are more apt to be treated at home in all parts of the world and this is especially true in India.

Cabot (1926) in a series of 239 cases reports the onset below the age of ten in 45 or 18.8 per cent, below the age of twenty in 125 or 52.3 per cent and below the age of thirty in 172 or 72.1 per cent. The figures in our much smaller series are as follows: below the age of ten 17 per cent, below the age of twenty 44.68 per cent and below the age of thirty 64.68 per cent. This would indicate a slight but definite tendency to a later age of onset in India. The age of onset in our series is shown in table III.

TABLE III

Age	M	F
1—5 ..	1	..
5—10 ..	6	1
10—15 ..	5	2
15—20 ..	5	1
20—30 ..	9	1
30—40 ..	5	2
40—50 ..	4	4
50 and over	1	..
TOTAL ..	36	11

Of our 47 cases of rheumatic heart disease, 35 or 74.4 per cent gave a definite history of joint pains and of these, twelve showed these symptoms during their stay in the hospital. Cabot reported that of 92 cases, 78 per cent had rheumatic arthritis as a factor, while tonsillitis seemed important in only 7 per cent. In these cases, 6 per cent had had chorea whereas none of our cases gave such a history. Our figures are compared with Cabot's in table IV. Twenty-five of our 35 cases with definite rheumatic history also showed infected tonsils. Making up the 12.7 per cent of cases showing

TABLE IV

Type of infection	Miraj, per cent	Cabot, per cent
Rheumatism ..	74.4	78.0
Tonsillar infection	12.7	7.0
Chorea ..	0.0	6.0
Other infections	12.7	7.6

'other infections' which may or may not have been of aetiological importance was one case with chronic otitis media, three cases with severe pyorrhoea alveolaris and two cases of intestinal parasites. The fact that our incidence of

rheumatic history approximates that obtained by Cabot in Boston does not run parallel to McLean's (1932) observation that the incidence of rheumatic carditis without a history or other clinical evidences of rheumatic fever is 50 per cent greater in Alabama than in New York.

An attempt has been made to judge and compare the severity of the cardiac damage done by the rheumatic infection. This is done in table V by a comparison of the number of valves involved. Both Cabot in his book on physical diagnosis and Lewis (1933) are agreed that mitral regurgitation of rheumatic origin is but the first step in a pathological entity that later will cause stenosis also. Lewis further maintains that many cases of regurgitation will reveal the stenotic murmur on more careful examination. The procedures he recommends have not always been employed in our cases and, as a result, we make no attempt to separate our early cases of mitral disease from our late ones. Since a number of our cases that are classified as combined mitral and tricuspid lesions are undoubtedly pure mitral cases with functional tricuspid regurgitation, this being a strong possibility in at least four of our five cases, the conclusion seems justifiable that multiple rheumatic valvular involvement is distinctly less common among the cases that we see.

Paroxysmal auricular fibrillation and chronic auricular fibrillation were each diagnosed twice in our series of rheumatic cases. These were not checked by electrocardiography. Subcutaneous nodules were not seen. Of our 47 cases, 27 were discharged as improved, seven were sent home as unimproved or distinctly worse and 13 died in hospital. Of these 13 deaths, seven cases came to autopsy. The results of these autopsies are summarized below. In two cases the mitral deformity was typically funnel-shaped.

Sclerosis of the mitral valve ..	2
Sclerosis of the mitral, aortic and tricuspid valves ..	1
Sclerosis of the mitral and tricuspid ..	1
Sclerosis of the mitral and aortic valves and adherent pericardium ..	1
Sclerosis of the mitral, aortic and tricuspid valves and adherent pericardium with vegetations on the mitral valve ..	1

TABLE V

Valves	Miraj, per cent	Cabot, per cent
Tricuspid ..	2.1	0.0
Mitral ..	65.9	51.7
Mit.-Aort. ..	12.7	15.8
M.-A.-T. ..	6.3	11.7
Mit.-Tri. ..	12.7	2.6
Aortic ..	0.0	15.8
Pul.-Tri. ..	0.0	1.3
4-valves ..	0.0	1.3
TOTAL ..	47.0	145.0

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THE PROGNOSTIC VALUE OF THE VARIATION IN THE ARNETH COUNT IN CASES OF ASTHMA TREATED WITH AUTO-VACCINE

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ACTON and Dharmendra (1933) noted that in the allergic cases of asthma the Arneth count

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As a result of the study of this series of cases we feel ourselves justified in drawing the following conclusions:

(1) Rheumatic fever, as shown by the presence of rheumatic heart disease, although not as prevalent as in other parts of the world, nevertheless is a common condition in the Bombay Deccan.

(2) The percentage of heart disease that is rheumatic in origin is greater than in other parts of the world.

(3) There would seem to be a slight but definite tendency to a later age of onset in rheumatic heart disease in the Deccan.

(4) The percentage of rheumatic heart disease without clinical evidence of rheumatic fever is no greater in the Deccan than elsewhere.

(5) The cardiac involvement in rheumatic fever in the Deccan does not seem to be so severe as in the north-western United States.

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was usually normal, while there was a marked shift to the left in the count in the bronchial cases which are dependent on some infection. By a 'shift to the left' is meant an increase in the single-lobed and two-lobed cells—the less mature forms—and a decrease in the multi-lobed, the more mature granulocytes. They observed that the Arneth index (sum of the number of cells with one and two-lobed nuclei and half the number with three-lobed nuclei) was generally below 70 in the allergic cases and above 70 in the bronchial cases.

In the present paper we have reported the changes in the Arneth counts produced by means of treatment with auto-vaccine in cases of asthma. Observations on 25 such cases have been recorded. In all the cases a vaccine

but in whom the symptoms returned after varying intervals of time. The third group of 11 patients who were definitely relieved of the symptoms and who have remained free so far (the second count in all the cases except one were done between December 1934 and July 1935).

When the variations in the Arneth count on the two occasions are correlated with these three clinical groups the relation between the improvement in the condition of the patient and the improvement in the shift to the left in the Arneth count becomes apparent.

The table shows that in group I in three cases there was an actual rise in the index, in one case there was no change, and in three cases a small fall after the treatment. In group II, in

TABLE

	Total number of cases	Number of cases in which the Arneth index increased	Number of cases in which there was no change in the Arneth index	NUMBER OF CASES SHOWING DECREASE IN THE ARNETH INDEX			
				Decrease of			
				5 or less	6 to 10	11 to 15	16 to 20
Group I Cases in which there was no appreciable improvement after the vaccine treatment.	7	3	1	3	..	..	..
Group II Patients who were relieved of their attacks but in whom the symptoms relapsed at varying intervals after the treatment.	7	..	1	2	4	..	..
Group III Patients who were relieved by the treatment and have so far remained free from attacks.	11	..	..	..	3	5	3

made from the organisms isolated from the sputum was used and a course of six injections was given. The first count was done on admission of the patient to the hospital and the second about two days after the last dose of the vaccine. In all the cases the Arneth count on the first occasion showed a marked shift to the left. At the second examination the count showed an even more marked shift to the left in three cases, no change in two cases, and a decrease in the shift, either slight or marked, in 20 cases.

From the point of view of the result of the treatment these 25 cases can be divided into three groups. The first group consisting of seven patients who showed no appreciable improvement in their symptoms after the course of the treatment. The second group consisting of seven patients who were definitely relieved

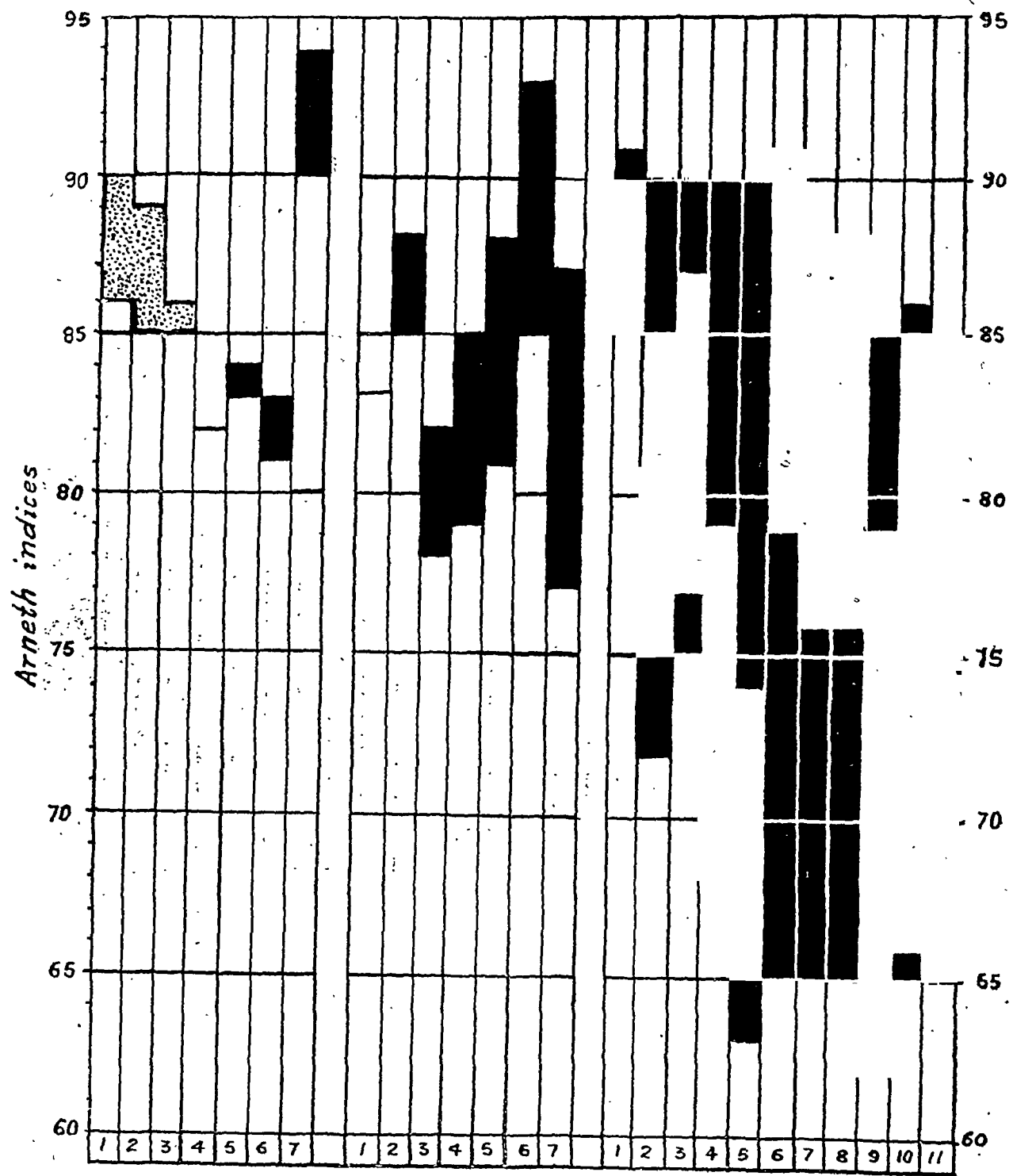
one case there was no change while in the other six cases there was a varying amount of fall in the index. In group III in all the eleven cases there was a fall, and in most cases a marked fall, in the index, i.e., a decrease in the shift to the left.

Figure 1 shows in graphic form the level of the Arneth index before and after treatment and the extent of the increase in the stippled areas—and of the decrease—the shaded areas—during treatment, that is, the increase or decrease, respectively, in the shift to the left of the Arneth count.

Figure 2 shows only the extent of change in the shift in the Arneth count after treatment with auto-vaccine. The shaded areas above the base line indicate the extent of decrease in the Arneth index, i.e., of the improvement in the shift to the left in the Arneth

count. The stippled areas below the base line show the extent of the change in the opposite direction. it fall by more than four; in group II the index fell by 3 to 10; in group III it fell by 10 or less in three cases and in the other eight cases

Figure 1 showing the Arneth indices in the 25 cases before and after treatment with auto-vaccine. The stippled areas indicate the extent of the increase and the shaded areas the extent of the decrease in the Arneth index during treatment.



Group I. Patients not much improved by the treatment. Group II. Patients definitely relieved but relapsed. Group III. Patients definitely relieved and remaining free from attacks so far.

It will be noted that in group I in three cases the index actually rose and in no case did the fall was more than ten. The same results are shown in the table.

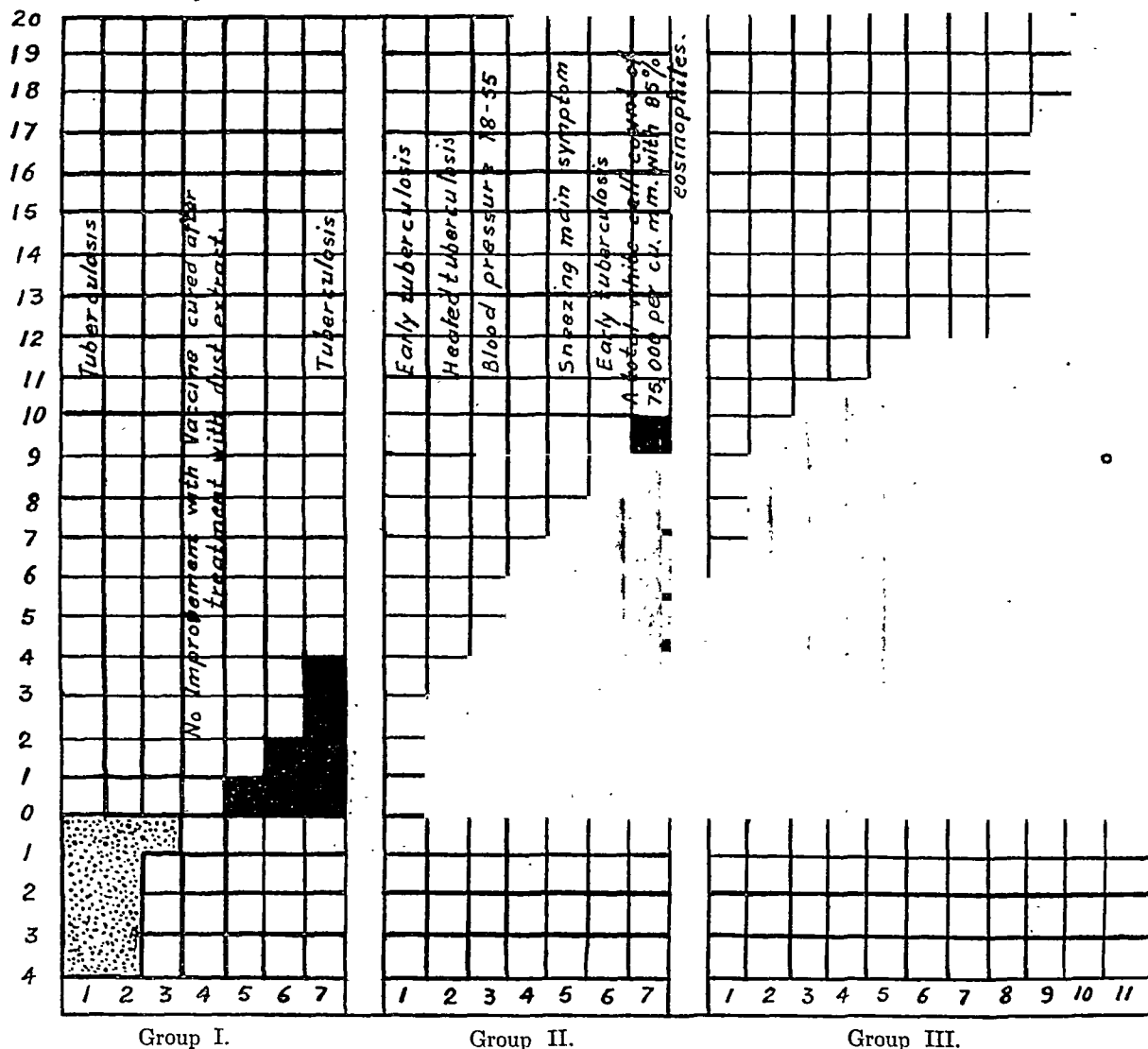
From the above observations the following conclusions become evident:—

(1) The initial Arneth count gives little information about the results to be expected from vaccine treatment. The initial indices in all the three groups ranged (*vide* figure 1) between 80 and 95 in most of the cases; only in two cases in group III was the index below 80.

(2) The Arneth count after the treatment gives some information on this point. In all

favourably to the treatment the index sometimes rises and in no case shows a marked fall. In the cases showing temporary improvement the fall in the index never exceeded 10 points. While in the third group of cases the fall was less than 10 in only three, and the remaining eight showed a fall of between 11 and 20 points. It can thus be said that a fall of 10 or more in the Arneth index after the treatment with auto-vaccine is a good prognostic sign.

Figure 2 showing the extent of change in the shift to the left in the Arneth count after treatment with auto-vaccine. Figures above the base line indicate the extent of decrease in the Arneth index; figures below the base line show a change in the opposite direction.



the cases in group I the Arneth indices after the treatment were above 80, in group II only in two cases were they below 80, but in group III in every case except one the indices were below 80. The fall of the Arneth index below 80 seems to be a favourable prognostic sign.

(3) The extent of fall in the index after the treatment gives the most information regarding the prognosis (figure 2 and table). It will be seen that amongst the cases not responding

A similar correlation between the improvement in the condition of the patient and in the Arneth count has been reported in cases of tuberculosis. Hamilton-Black (1913) observed that in certain cases of tuberculous disease tuberculin treatment improved the Arneth count, making the shift to the left less marked. Holroyd (1913) noted that in cases of tuberculosis the improvement in general condition was

(Continued at foot of opposite page)

A CASE OF IRON ENCEPHALOPATHY

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AN Indian male, aged 30 years, a casual labourer, was admitted to the Carmichael Hospital for Tropical Diseases on 28th October,

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accompanied by an improvement in the shift to the left in the Arneth count. Kennedy and Flint (1930) found that the Arneth count in cases of surgical tuberculosis treated by natural heliotherapy in the Alps showed a much less degree of shift than in the cases treated in Britain.

Clinical analysis of those in which there was no or only temporary improvement

(1) Amongst the seven cases not responding to vaccine treatment two had definite tuberculous lesions in the lungs, shown by a skiagram of the chest. In one the asthma was not of a bronchial type but of the allergic type (due to dust sensitiveness) and later this patient was relieved by means of hypo-sensitization with the dust extract.

(2) Amongst the seven cases showing temporary relief the skiagram of the lungs showed early tuberculous lesions in the two cases and healed tuberculosis in one case. In one case the cause of asthma was some endocrine dysfunction; the blood pressure in this case was 78 systolic and 55 diastolic and the attacks were mostly associated with the monthly periods. In one case there was a white cell count of 75,000 per c.cm. with an eosinophilia of 85 per cent. The high eosinophilia tends to show that in this case the main cause of the asthma was some undetermined allergic factor. In one case the main symptom was sneezing.

The consideration of these points throws some light on the causes of the failure of response in the Arneth count and in the improvement of the patients' condition. These causes may thus be summarized as follows:—

- (1) Some serious underlying disease such as tuberculosis.
- (2) Bronchial sepsis only superadded, in a case of true allergic asthma.
- (3) The absence of any bronchial factor.
- (4) The bronchial factor being present but being unaffected by the vaccine treatment.

Summary

- (1) The Arneth counts in 25 cases of asthma before and after treatment with auto-vaccine from the sputum have been presented.
- (2) The counts showed a marked shift to the left before treatment in all the cases.
- (3) After the treatment this shift was reduced in the cases favourably affected by the treatment.
- (4) It is suggested that marked improvement in the Arneth count after treatment with the vaccine is a good prognostic sign.

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1935; the provisional diagnosis was nephritis with secondary cardiac complications.

He complained of anæmia, palpitation, breathlessness, weakness and swelling of the legs.

He was found to have a systolic murmur at the pulmonary area, heard also at the apex, but not conducted into the axilla. His face was puffy and he had marked œdema of the feet and ankles; neither spleen nor liver was enlarged. He had no albumin in his urine. He had an intermittent temperature rising to 100°F. in the afternoon each day, later it rose higher—up to 104°F. for two days—and became remittent; his pulse was usually about 90 per minute but later, when the temperature went higher, it rose to 110.

HEMATOLOGICAL FINDINGS

Hæmoglobin—2.47 grammes per 100 c.cm. of blood (i.e., 18 per cent of 13.75 grammes).

Red cell count—1,880,000 per c.mm.

Reticulocytes—3.6 per cent.

Leucocytes—2,650 per c.mm.

Polymorphonuclears—68 per cent.

Lymphocytes—26 per cent.

Large mononuclears—5 per cent.

Eosinophiles—1 per cent.

Cell volume—14.2 per cent.

Mean corpuscular hæmoglobin—13.14 $\gamma\gamma$ (normal = 28).

Mean corpuscular volume—75.53 cu. μ (normal = 90).

Mean corpuscular hæmoglobin content—17.40 per cent (normal = 31).

Colour index—0.47.

Volume index—0.84.

Van den Bergh tests—direct and indirect both negative.

Urobilin—distinct in undiluted urine.

Gastric analysis.—Definite hypochlorhydria. Free hydrochloric acid, except for a trace at half an hour, in two samples only, after 1 and 1½ hours; the highest was 12 c.cm. of N/10 HCl in the latter sample.

Wassermann reaction—'slightly positive'.

Stools for helminths—600 hookworm ova per gramme of stool.

Other examinations.—Repeated bacteriological and protozoological examinations of the stools, and blood examinations for malaria parasites were 'negative'. The serum agglutination test for enteric and other organisms, the aldehyde and the antimony test, and a blood culture for leishmania were all negative.

Diagnosis.—Simple hypochlorhydric anæmia.

The patient was on an iron-poor diet, his absorption was defective, and his anæmia was probably increased slightly by a low-grade hookworm infection.

Treatment.—Quinine sulphate 20 grains a day for 7 days had no effect on his fever. He was given no treatment for the hookworm infection at this stage.

On 4th November, he was put on to ferrous sulphate tablets, six grains three times a day, and half a drachm of dilute hydrochloric acid twice a day. The iron was given for 26 days, but the hydrochloric acid was continued throughout his stay in hospital.

Progress

Date		Reticulo- cytes, per cent	Hæmo- globin, grammes per 100 c.cm.
29-10-35	Before treatment	3.6	2.47
9-11-35	After 5 days	21.0	..
13-11-35	" 9 "	14.0	..
14-11-35	" 10 "	15.1	5.77
19-11-35	" 15 "	5.9	..
21-11-35	" 17 "	4.2	..
23-11-35	" 19 "	4.6	..
26-11-35	" 22 "	3.5	10.31
19-12-35	" 45 "	0.7	11.41
4-1-36	" 61 "	0.8	10.45

Temperature.—After 10 days of iron treatment the temperature began to fall and on the 22nd it reached normal.

Epileptiform seizures

On 30th November after the patient had had iron for 26 days, that is to say $6 \times 3 \times 26 = 468$ grains of ferrous sulphate, he had a fit at six o'clock one morning; when seen by the house physician he had recovered but had twitchings of the muscles of the face and was drowsy.

At 7-30 he had another fit; he had clonic spasms of the muscles of his neck, face, arms and legs; he bit his tongue. He became completely unconscious and the corneal reflex was lost. The fit lasted about five minutes. This was followed by a third similar fit at 9-15. I saw him in another fit at about 10-15 whilst doing my round of the wards. He had been speaking to me just before and complained of severe headache ever since the first fit; he was not able to describe any aura; the fit came on suddenly whilst he was lying in bed; this fit lasted longer—about 20 minutes. During the day he had three more fits of apparently increasing severity and after the last he seemed exhausted, his pulse was irregular and bounding, he had some congestion of the lungs, and he was cyanosed. He was given oxygen for 15 minutes and a strophanthin injection.

A lumbar puncture was done by Dr. Chaudhuri; the fluid was found to be under slight pressure but was otherwise normal; there was no increase of the cellular elements and it was sterile on culture. The iron administration was of course discontinued.

On the following day he was quite normal except that he had a slight headache which persisted for a few days.

His temperature rose to 101°F. on the days he had the fits, but on the next two days was 99°F. and then it fell to normal again. A potassium bromide mixture was given for three days only.

On 16th December he was given tetrachlor-ethylene 4 c.cm., and oil of chenopodium 1 c.cm., for the hookworm infection. Later, stool examinations showed no ova present.

As his blood hæmoglobin showed a tendency to fall he was again put on to iron; ferrous sulphate was given in smaller doses, grains 3 thrice daily. His further progress was as follows:—

Date	Days of second iron treatment	Reticulo- cytes, per cent	Hæmoglobin, grammes per 100 c.cm. blood
4-1-36	..	0.8	10.45
13-1-36	5	1.7	..
15-1-36	7	2.0	..
18-1-36	10	0.2	14.02
27-1-36	19	..	15.95

On 27th January his blood count was as follows:—

Hæmoglobin—15.95 grammes.

Red cells—6,000,000 per c.mm.

Cell volume—53.4 per cent.

Mean corpuscular hæmoglobin—26.58 $\gamma\gamma$.

Mean corpuscular volume—89.00 cu. μ .

Mean corpuscular hæmoglobin concentration—29.87 per cent.

Colour index—0.95.

Volume index—0.99.

Fractional gastric analyses (alcohol)

Free acid in terms of N/10 hydrochloric acid per 100 c.cm.

	Blood hæmo- globin	Fasting juice	Samples after								2 hrs.
			1	1 1/2	3	1	1 1/2	1 1/2	1 1/2	1 1/2	
2nd Nov.	2.47	0	0	2	0	6	12	0	0	0	0
30th Jan.	16.00	0	0	6	8	10	14	2	8	10	10

Weight.—The patient weighed 86½ lbs. on admission but he had œdema. His weight fell to 82¼ on 26th November. His weight had increased to 95 lbs. by 19th January.

Discussion

The patient gave no history of ever having had epileptic fits before; he has had none since. He gives no history of head injury and shows no evidence of any such injury.

The dose of iron that he was receiving was a big one; the pharmacopœial dose of ferrous sulphate is 3 grains, but we have given 27 grains a day to tea-garden coolies without any ill-effects, a total of 522 grains in a period of three weeks. He was, however, a small man—making allowance for the œdema—only about 80 lbs.

About a year ago another case of fits following the administration of large doses of iron occurred in this hospital. This was a woman who had had 12 grains of ferrous ammonium sulphate a day for 33 days; she had a strongly positive Wassermann reaction, and for this reason no special note was taken of this case at the time.

Hurst (1934) reports a case of encephalopathy following the administration of 40 grains of iron

and ammonium citrate four times a day for 21 days; on the other hand Witts (1933) has given as much as 300 grains a day without ill-effects.

This patient also had 'slight positive' Wassermann reaction, but gives no history of syphilis and has no stigmata. In both cases there was some serological evidence of syphilis and it seems just possible that such patients are more susceptible than the normal to large doses of iron.

Amongst normal individuals the degree of susceptibility to any drug is always a variable factor, and it is possible that this dose of 468 grains ($6 \times 3 \times 26$) in a period of 26 days to a man weighing only 80 lbs. is one that will produce symptoms in the exceptional individual. Further, it is probably an unnecessarily large dosage, or at least one that need not be continued for so long, and we have now made a rule to continue this dosage for not more than three weeks at a time.

Hurst (*loc. cit.*) said that his patient 'almost died' after 3,360 grains of iron and ammonium citrate in three weeks; this represents a smaller amount of utilizable iron, according to the figures quoted by Witts (1936). I do not, however, know how near to death my patient was, nor was Hurst explicit regarding his mensural technique. Although the symptoms were extremely alarming, on the following day the patient was little worse for the attack.

From other points of view this case is more instructive than remarkable.

The diagnosis.—There was much excuse for the original clinical diagnosis, though it was obvious that there was a greater degree of anæmia than is usually produced by either heart disease or kidney disease alone.

In this country the clinical picture is nearly always obscured by a multiplicity of helminthic and protozoal infections, but on more careful examination supported by clinical laboratory findings it became obvious that an anæmia of a microcytic type was the most important defect.

The fever.—This was low at first, rising only to about 100°F. , and did not attract any particular attention, as such a degree of fever is common in extreme anæmia, but later it rose to 102°F. daily, and, as no cause for it was found after repeated blood examinations, quinine was given in adequate doses for seven days as a therapeutic test. As this had no effect on the fever a blood culture for leishmania was done; this also was negative. The disappearance of the fever with the anæmia and the failure to find any other cause for it during the patient's stay in hospital—about three months—does seem to indicate strongly that the two conditions were closely associated, and that the fever was secondary to the anæmia.

The hypochlorhydria.—A low gastric acidity is often found in cases of severe anæmia, but

(Continued at foot of next column)

INJURIES OF THE SKULL

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AFTER two and a half years in India my first case of injury of the skull was sent in to me.

The man had fallen from the top of a bridge pier, about 60 feet high, into a dry river bed near Quetta. He was unconscious, there was no sign of injury on the scalp or anywhere else

(Continued from previous column)

it is not a constant finding as has been suggested by Apperly (1936), and we have a patient in hospital at present with only 2.75 grammes of hæmoglobin per 100 c.cm. of blood, and hyperchlorhydria. It is not possible to say which is primary, the anæmia or the lowered gastric acidity, in many cases of anæmia associated with achlorhydria or hypochlorhydria. In this case, there seems little doubt that the poor gastric acid secretion was primary and that possibly the defect was exaggerated slightly by the anæmia. Even after a sixfold increase in hæmoglobin the maximum acidity only increased from 12 to 14 c.cm. N/10 hydrochloric acid.

The reticulocyte response.—This was in every way characteristic. In cases in which the hæmopoietic tissue is functioning properly, there is always some degree of reticulocytosis when the hæmoglobin is as low as it was in this case. At the first examination it was 3.6 per cent; there was a sharp rise, 21 per cent, on the fifth day of iron administration and then a steady fall, the original level being reached about the twenty-second day. When the second course of iron was given there was practically no reticulocyte response. This again is what one would expect, as, provided the dosage of the deficient factor—iron in this instance—is maximal, the response is always in proportion to original level of hæmoglobin. It will be noted, however, that the actual rate of hæmoglobin regeneration was more rapid during the second course than during the first, as in the first the hæmoglobin improved by 3.3 grammes in ten days against 3.57 grammes in the second in the same number of days. This shows that the reticulocyte response *per se* is not an indication of the rate of blood regeneration; this is a generally recognized fact.

The hookworm infection.—It is obvious that the hookworm infection had little depressing effect on the blood regeneration, and, although there was a slowing up of the regenerative progress, the slight tendency to regression in the hæmoglobin percentage was noticeable only after the worms had been removed.

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except that he had a large retropharyngeal effusion of some sort sufficient to threaten respiratory obstruction. He had evidently come down on the crown of his head and had a fracture of the skull presumably from one jugular foramen to the other which led to the retropharyngeal effusion.

I instructed the attendant to send for me at once if respiratory trouble set in—I lived a few minutes' walk from the hospital—an hour or so later consciousness was returning definitely so I presumed that there was no fracture of the vertex and no pressure on the cerebral cortex. The effusion did not increase and soon began to diminish so that it was not necessary to do anything beyond nursing. He rapidly recovered and was able to resume work after three months as a mason's attendant, but he did not like pier masonry.

Standard teaching is that fractures of the base of the skull are very much more fatal than fractures of the vertex. This doctrine should be altered as the reverse is the case but it is always difficult to get a doctrine, which is based on tradition, altered. This was the severest type of fracture of the base and yet he made a rapid and perfect recovery.

The next case came into hospital unconscious from a blow of a beetle on the head, though there was no wound on the scalp and no x-rays in those days. I assumed that there was a fracture of the vertex and extra-dural hæmorrhage. It was a medico-legal case. I exposed a fissure in the temporo-parietal region, I took out a full-sized trephine disc and scraped and washed out the clot, as I thought, thoroughly. He did not recover consciousness and died. I did a post-mortem examination and was surprised to find that I had left most of the clot behind and I had only scraped furrows in it. I had to appear in court of course, and I discovered that these clots adhered to the skull and dura mater with great tenacity—so much so that scrapers and spoons used through a trephine hole are practically useless in the area beyond the width of the trephine opening. Clots of this kind usually cover an area three inches or more in diameter. I decided to use my naked index finger and finger nail on the next case instead of spoons and scrapers. I had plenty of them as I was having up to 150 medico-legal post-mortem examinations in the year—twenty-five years at Jullunder and Amritsar; a considerable proportion of these were skull injuries. In the next similar case I took out a disc of bone and enlarged the opening to let in my index finger full length easily, and found my finger nail an ideal weapon guided by the feeling of the finger tip. I continued the use of this simple 'weapon' and from that case on I rarely had a death from extra-dural hæmorrhage.

Another case of interest was a man who had got a blow of a beetle over the centre of the

crown. He was unconscious. He had no scalp wound, but a little effusion beneath the scalp which indicated where the blow had been struck. I made an antero-posterior cut across the site of injury; this exposed a transverse fracture which I followed from ear to ear. I cut a trench the full length from ear to ear wide enough to admit my index finger and scraped out the clot, being careful to get the whole of it out. I then caught him by the forehead with one hand and the occiput on the other to test if the fracture had gone further. The front and rear halves of the skull moved freely independently of one another. I put a few stitches in the scalp wound in the middle, and put on a dressing. A few hours later consciousness was returning and was quite returned next morning. When I finished there was a cavity which the clot had occupied which would be of cubic capacity of four to five ounces of fluid. I stitched up the wound completely without a drain as there was no oozing. About a month later he appeared in the witness box to give evidence against his assailant. I was present as a medico-legal witness and heard him stand a cross examination, which he did well. I saw him a year afterwards and he was quite well. This was as severe a fissured fracture of the vertex and of the base, as anyone is ever likely to come across. The clot on the vertex was properly removed and the fracture of the base was left to take care of itself.

Contrecoup.—A case of interest was a boy of sixteen; he was brought into hospital unconscious; he had got a blow on the temporo-parietal region of one side of the head. I cut down there in search of a fracture; there was none. I took out a disc in that region; there was no hæmorrhage there. I exposed the opposite side of the skull; there was no fracture there. Nevertheless I took out a trephine disc and discovered a large clot which I removed and the patient did well; the only explanation I can give is that the skull had enough of the elasticity of youth to stand the strain without fracturing but that the concussion alone was sufficient to detach a small portion of the dura mater which very soon became large. This case shows how easy it is to detach the dura mater from the vertex of the skull. Fractures with hæmorrhage between the dura mater and the skull commencing just under the fracture and thus rupturing more and more of the thin-walled arterioles going from the dura mater to the inner table of the skull. The speed of this dislocation will depend on the size of the vessels ruptured as the larger ones have a higher blood pressure than the smaller ones and hence unconsciousness sets in sooner in fractures of the temporal region than elsewhere.

In the many cases (post-mortem and ante-mortem) that I have seen, a striking fact was that the blood clots beneath fractures of the vertex are always uniform in size. The reason

for this is evident. The blood pressure of these effusions is higher than the pressure of the cerebro-spinal fluid, and hence, the brain tissue being mouldable, the cerebro-spinal fluid is driven out of the skull into the spinal canal.

The blood pressure in these clots, considering the size of the vessels ruptured, I should think seldom exceeds 30—40 mm. Hg., so that it is not sufficient to rupture or lacerate the brain or do irreparable damage to it; the cubic capacity of the cerebro-spinal fluid is thus the maximum size possible of the clot underneath fractures of the vertex and is the explanation of the fact that such clots are so uniform in size.

Fractures of the base.—Of these I have seen many; in some the bleeding is into the nose, in some it is retranasal, in some retropharyngeal and in some from the ears. The retropharyngeal ones are much fewer in number than the others. I have seen cases in the post-mortem room in which fractures of the vertex not infrequently radiated into the base, the radiations only being exposed when the dura mater was stripped off the floor of the skull. The cases of fracture of the base which came before me clinically, diagnosed by bleeding from the regions above, noted following severe violence, when not complicated by fractures of the vertex, as indicated by persistent unconsciousness (the symptoms of hæmorrhagic pressure between the dura mater and the skull), do well when not interfered with. They may be unconscious for a short time immediately following the violence, but usually recover, well within an hour. If unconsciousness lasts more than that time fracture of the vertex and extra-dural hæmorrhage should be suspected and explored for.

How is this to be explained by the schools? I never saw a case in which the dura mater of the base was dislocated and flooded up by hæmorrhage without which pressure on the brain on that region is impossible. This will be evident to any one who, in doing a post-mortem, extracts the dura mater from the floor of the skull as should always be done in medico-legal post-mortems in case of injury to the skull. The dura mater is so firmly fixed to the floor of the skull that much higher pressure than the available arterial pressure would be required to dislocate it, and hence in practice it never occurs.

The dura mater of the vertex is very easily torn out and hence it is so generally dislocated by the trifling arterial pressure available from the few ruptured arterioles beneath the fracture. This little pressure is sufficient to rupture other adjacent arterioles and so it goes on until the cerebro-spinal fluid is expelled, when it stops of necessity. Even when the clot is at its maximum the pressure through the dura mater is trifling and not sufficient to do damage to the brain. *I presume the absence of the cerebro-spinal fluid has most to do with the unconsciousness and abeyance of other functions of the*

brain, leading to death. After removal of these extra-dural clots, as the cerebro-spinal fluid becomes re-established, consciousness returns.

In practice an injury of the skull followed by unconsciousness comes first before a general practitioner. He sends the case to the nearest hospital where the surgeon takes charge. Public sentiment obliges him to do so, however capable he himself may be. He has no more to do with it; the hospital authorities will not allow him to have anything to do with it. Public sentiment is very wrong in this attitude as time is a grave consideration in these cases apart from the fact that the general practitioner should be just as competent to operate on these cases as the hospital surgeon. The general practitioner who feels competent to operate on these cases should do so in the patient's house or in a nursing home; in any case he should insist on being considered in connection with the treatment of the case. The operation is one of the simplest in surgery. The operation does not need an assistant, the patient is unconscious and does not need an anæsthetic and as far as instruments are concerned he can get an inch gouge and a small carpenter's chisel in any local hardware shop. All he needs in addition to these is a needle and thread, a mallet, a scalpel, and his own index finger. The gouge will bore the hole in the skull as well as a trephine, he can enlarge it and trim the edges with a small chisel. The indications for exploring are clear, if the operator finds no hæmorrhage there is no harm whatever done. The patient is to die anyhow and exploring will not shorten his life by one minute, but he will rarely fail to find hæmorrhage beneath the fracture of the vertex.

I hold that it is the imperative duty of the surgeon to explore for hæmorrhage beneath fractures of the vertex with unconsciousness lasting an hour as the outside limit. In cases in which unconsciousness sets in a few minutes after the injury, he should explore at once as this unconsciousness is not due to shock which sets in at once.

Those who wait with unconsciousness for something favourable to turn up will find that it is a funeral which turns up almost invariably.

Splinters of bone driven through the dura mater into the brain, we occasionally come across, from a heavy blow of a semi-sharp weapon. There is a free outlet for blood in such cases, hence they should be treated by ordinary surgical principles.

Apart from these splintered cases hæmorrhage into the pia arachnoid hardly ever occurs. In splintered cases in which the splinter cuts through the dura mater there may be a mere trace of hæmorrhage in the pia arachnoid, but so little that it is of no practical importance and can safely be left there. In fact it is so attached to the membranes that the insignificant film could not be removed.

This paper is based on the personal experience of a wealth of material such as has not been surpassed by that of any man hence I do not pad it up with reports of cases but give my conclusions after careful considerations of that experience as a whole; neither do I quote authorities. I go my own way uninfluenced by any authority.

[*Note*.—The writer of this paper has a world-wide reputation as an ophthalmic surgeon and he can rightly claim that much of his success was due to the originality of his methods. Nevertheless, we feel that we cannot pass the last sentence of his paper without some protest.

If the principle by which Colonel Smith appears to be guided were universally accepted and followed to its eventual conclusions, medical—including surgical—science would cease to advance. Surely, no one can afford to be guided *only* by his own experience—even if that experience is so vast that he can boast that it 'has not been surpassed by that of any man'. In these days when the daily toll of the roads is mounting so rapidly in every civilized country, there must be many other surgeons whose experience justifies the drawing of 'conclusions after considerations of that experience as a whole'. In our experience of the literature of head injury, the majority of these 'conclusions' differ materially from those of Colonel Smith.

There are many points on which Colonel Smith's opinions are unorthodox. To mention two only—we cannot agree that, when expert surgical assistance is within reasonable call, a practitioner with little experience should undertake immediate operation in unsuitable surroundings with instruments not designed for the purpose, nor do we consider the unsterilizable finger nail a legitimate weapon for brain surgery.

We append a short note on head injuries kindly contributed at our request.—EDITOR, *I. M. G.*

NOTES ON HEAD INJURIES

The gravity of head injuries depends chiefly on the extent of damage, sustained by the intracranial structures. A careful neurological investigation becomes, therefore, a necessity, not only from an academic point of view but from that of treatment. Skiagraphy is indispensable in every case and the advantages of lumbar puncture, both diagnostic and therapeutic, are too evident to require any emphasis.

It is customary to divide injuries of the skull into simple and compound fractures and again into fractures of the vault and of the base, although these conditions may be associated. The dura mater, being firmly adherent to the base of the skull, is more easily torn in the case of basal fractures. Under injuries of the brain, may be included cerebral concussion, compression and laceration, but these conditions are usually coexistent. Extra-dural arterial hæmorrhage is commonly of middle meningeal origin and the bleeding vessel can be secured without difficulty. Cortical veins are very thin and fragile and may easily rupture, giving rise to extravasation of blood and formation of a subdural hæmatoma. In such a case, the symptoms are latent for a time after the injury.

The indications for operative treatment in the case of head injuries are definite, and operative procedure should not be undertaken in a spirit of levity; it is imperative that asepsis and

hæmostasis are ensured in every case. The immediate indications for operation may be briefly enumerated here:

(i) Elimination of infection—wounds of the scalp may be excised and compound fractures rendered surgically clean.

(ii) Control of hæmorrhage—from the scalp, diploë and intra-cranial structures.

(iii) Relief of pressure symptoms—cerebral compression of recent duration may be due to depressed fracture, extravasated blood, traumatic œdema and foreign bodies.

Owing to the increase of road accidents, head injuries are becoming more frequent in emergency surgery. The most serious complications are due to injuries to the cranial contents. In the absence of complications, it is the experience of most surgeons that no untoward results follow in the majority of cases, in which conservative treatment is adopted. Post-traumatic cerebral complications and sequelæ present a different problem for the neurologist and for the surgeon. In reality, the subject of head injuries is an extremely difficult one. The aphorism of Hippocrates that 'no head injury is so trivial as to be ignored or so serious as to be despaired of' may be remembered with humility.

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A Mirror of Hospital Practice

MULTIPLE PARALYSIS FOLLOWING MEASLES

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B., a female child, aged 4 years, was attended by me in February 1935. She had a temperature of 104°F., sore throat, running from the nose and conjunctivitis for the last two days. On the fourth day of the disease, she developed the typical rash of measles all over the body and Koplik's spots inside the mouth. On the seventh day, she developed broncho-pneumonia of the right lung, followed by similar signs the next day in the left lung. The case was treated on usual lines and passed on to convalescence after four weeks.

Her temperature came down and she started moving about. In the eighth week when the child was progressing well, the mother noticed one morning that it had difficulty in walking and fluids passed through the nose instead of being swallowed. There was also some dyspnoea. I was again called to see the girl and found that both the legs were paralysed. Paralysis being that of the lower neuron type. There was paralysis of the soft palate and weakness in the movements of the chest, probably due to defective function of the diaphragm. The case was treated with iodides, nux vomica and electricity and was cured in two months.

Paralysis following measles is a rare occurrence so it was considered worth while publishing this report.

Indian Medical Gazette

MARCH

NUTRITION REQUIREMENTS

We print elsewhere part of a report on 'The Physiological Bases of Nutrition' recently published by the League of Nations Health Organization. In September 1935 the Second Committee of the Assembly devoted three days to a discussion of nutrition in relation to public health, agriculture, and economics. The most important conclusions which emerged may be summarized as follows:—A general increase in the consumption of the more nutritious food-stuffs would raise health standards and at the same time stimulate agricultural production; this in turn would have a beneficial effect on world trade and hasten economic recovery. The problem of increasing consumption was delegated to a 'mixed committee', including agricultural, economic, and nutrition experts, which was to meet in February 1936. In order to provide a solid basis for this committee to work on, it was necessary to define as exactly as possible, in the light of modern knowledge, the nutritive requirements of human beings. This is what the present report, drawn up by a number of leading nutrition workers from England, the United States, France, Sweden and Russia, attempts to do. Its conclusions will be laid before the 'mixed committee'.

The dietary standard adopted is, qualitatively speaking, a high one. The value of the 'protective' foods—'milk and milk-products, eggs, glandular tissues' and 'green leafy vegetables, fruit, fat, fish, and meat (muscle)'—is emphasized throughout. In the various tables one finds a novel method of laying out diet schedules; the 'protective' foods, yielding a proportion of the total energy requirements, are grouped together and the amounts of each specified, while the remainder of the diet can be made up from cereals, fats, and sugar as needed. This means, in effect: 'first eat what you should; then you can eat what you like'. One litre of milk per

day is recommended for pregnant and nursing mothers, and for growing children; this seems a high figure, but there is no question of 'stuffing' involved. The 'protective' foods, abundantly present, replace some of the cereal foods which at present figure over-prominently in average diets. The standard of calorie intake suggested—2,400 net per day for an adult being, in ordinary everyday life, in a temperate climate and not engaged in manual work—cannot be considered excessive.

Another new departure, conforming with the general trend of modern dietetics, may be noted; the emphasis is on foods rather than on food factors. The modern nutrition worker, in assessing the value of a diet, has learnt to think in terms of the foods it contains without making preliminary calculations of its protein fat, mineral, and vitamin content.

The report recommends a type of diet which is better than, but does not radically differ from, the ordinary diets of Western civilization. It provides the necessary foundation for agricultural, economic, and public health nutrition policies in Europe, North America, Australia, New Zealand, etc. But as far as the East is concerned, a different approach will be necessary.

It would be at present absurd to adopt so high a standard of dietary requirements in such countries as India, Malaya and China—as absurd as to suggest the introduction of tiled bathrooms into Indian villages. The nutrition worker in the East must adopt a far lower standard, a standard which does not and cannot represent the *optimum*, but nevertheless represents a decided improvement on existing habits. He can aim at a little more milk, more green vegetables and fruits, the partial replacement of cereals by legumes such as soya bean, the greater use of unmilled cereals, and so on. Granted these limitations, there is no reason why Eastern dietary standards should not be defined and used for the same purposes as those for which it is hoped the report under discussion will be used. When a little more data has been collected, the League of Nations might well convene an Eastern Commission on Nutrition to lay down minimum dietary standards in terms of Eastern habits and foodstuffs.

W. R. A.

Special Articles

THE RADIO-ACTIVITY OF THE THERMAL SPRINGS OF RAJGIR

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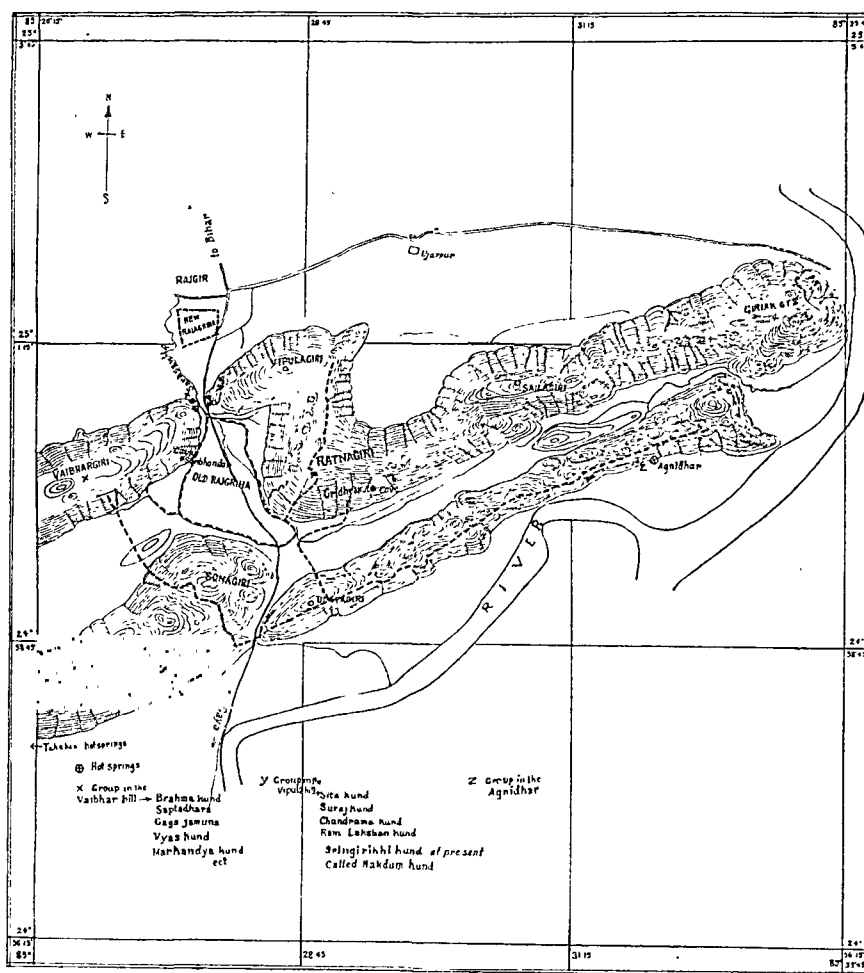
THERE are spas and health resorts all over the world where invalids and people with chronic illness flock in great numbers every year. The special importance of these places

general. Whatever may be the cause of their alleged healing power it is beyond doubt that most people derive immense benefit from a sojourn to these places and considering the general state of health in India any natural therapeutic agent would be welcome.

With a view to exploring the possibilities of the thermal waters of Bengal and the neighbouring provinces for therapeutic purposes I took up in detail the investigation of the springs in and around Rajgir.

A short description of Rajgir with the topographical map (map I) should be of some interest in view of its historical importance. Rajgir is

MAP I



Rajgir with its hills to Giriak.

lies in their springs, which are usually hot and hold in solution large quantities of mineral organic and gaseous matters to which for centuries their healing power has been ascribed. The modern view, however, tends to attribute the beneficial effects of these places to change of environment, rest, disciplined exercise, diet and habits of life, rather than to any special therapeutic power of the water of the spring. Some of these springs contain radio-active elements which, combined with a hot bath, have probably a stimulating effect on metabolism in

now a small village (population 2,700), 14 miles south-west of Bihar subdivisional town of Patna district. Historically, archaeologically and religiously, Rajgir is one of the most important places in India, being the prehistoric capital of Jarasandha and at one time the royal residence of Bimbisara, Ajatsatru and Udayan. Lord Buddha first studied and after attaining Buddhahood used to live there in retreat and often preached and taught his disciples. There are many Jain temples on the hills which are associated with the memory of Lord Mahabir

and his disciples. The old city was surrounded by five hills, namely, Vaibhar, Vipula, Ratna, Uday and Sonagiri. Fa Hien and Hiuen Tsang, two Chinese travellers, mentioned Rajgriha with Tapata (hot stream) in their account of this district. At the foot of the mount Vaibhar runs the Saraswati river and there are stream water reservoirs on the west, as well as on the east bank of it. The spring water reservoir at

Experimental

The study of these thermal springs was conducted in the following manner:—

I. Spot analyses (done *in situ*) were made of the radio-activity and of the gaseous contents, the physical characters of the different spring waters being noted. The radio-activity was estimated by using Prof. Schmidt's electrometer. The results are summarized in table I.

TABLE I

Name	Tempera- ture, °C.	PARTS PER 100,000		RADIO-ACTIVITY		PHYSICAL	
		Free CO ₂	Dissolved oxygen	Gaseous emanation in M. U.*	Per litre in M. U.*	Colour	.. Odour
<i>West bank.</i>							
Saptadhara ..	40	4.9	0.23	..	1.2	Clear	Slight.
Brahma Kund ..	42	11.3	0.29	414.6	8.0	Trans- parent.	Slight fishy.
Ganga Jamuna ..	41	3.7	0.4	..	3.8	Clear	Slight.
Kund Vyas Kund ..	40	3.7	0.52	..	2.3	"	"
<i>East bank.</i>							
Sita Kund ..	40	8.9	0.45	..	5.2	"	"
Suraj Kund ..	40.5	10.5	0.39	..	6.3	"	"
Ram Kund (cold) ..	35	3.1	0.69	..	5.0	"	"
Sringirikhi' or Mokdum Kund.	35	8.1	0.28	..	5.8	"	"
Saraswati river ..	30	0.8	0.5	..	Trace	Hazy	Slight earthy.
Well at Buddhist temple	28	1.7	0.53	..	Nil	Clear	Slight.

$$* [M. U. (Maché unit) = \frac{1}{3,000,000} \text{ millicurie}]$$

the foot of the Vaibhar hill has seven outlets whereas the spring water reservoir at the foot of the Vipulagiri has only six, most of which find their way into the said Saraswati river. These springs are shown in map I. Rajgir still enjoys a reputation as a place of popular Hindu pilgrimage and a health resort in winter. Our study of these springs was carried out in the following manner.

Geological observations

The Rajgiri hills consisting of slaty schists and quartzites are less metamorphosed (map II). The locality is situated beside the rich mica-bearing belt of Bihar. In fact, the south-west corner of Gaya district (close to Rajgiri) forms part of the mica-producing area which coincides with a great belt of schists and associated gneissose granite, some 12 miles broad and 50 miles long stretching from Hazaribagh through the south of Nawada subdivision into Monghyr. Hence the mica-bearing ores are one of the prominent minerals found in the southern, eastern and western neighbourhood.

In this table important springs which are commonly used are included, all of which are typical ones of the locality. In addition to these a local surface well and the river Saraswati are also included for comparative study. Spring waters are more or less radio-active and thermal, and, as they come from a great depth, these waters can be considered to be reasonably free from surface contamination. The river Saraswati though partially fed by the outflow water of these springs shows little radio-activity. As the units of radio-activity M. U. (Maché unit) are not higher than ten except for the gas, their radio-activity is to be considered weak.

II. Samples were brought to the laboratory without delay for complete mineral analysis. Table II will show the mineral contents of this radio-active thermal spring.

These samples were collected and analysed in the month of October. The total solid matter in solution was very small, ranging between 4 to 6 parts per 100,000, and the nature of the minerals was similar. The greater portion of their contents is in all probability mica (Al₂O₃, SiO₂.Mg) in solution as its characteristic sheen

the Singar mica mines in Gaya district. These springs therefore are not superficial, but, coming from a distance, derive their radio-activity by passing through this kind of ore. Again it is a well-known fact that the greater number of hot springs in all parts of the world are found in volcanic mountainous districts. Notwithstanding the fact that outbreaks may not have occurred for centuries, evidence of their former activities may be observed by the presence of old craters, lava-beds and rugged corrugations. In volcanic areas elsewhere, less violent, secondary phenomena, such as hot springs, geysers and fumaroles emitting smoke, give evidence of activity beneath. As regards the possible existence of previous volcanic activity, we have the account of Chinese travellers that there was a mountain emitting thick volumes of smoke darkening the sky above, which was seen even from the then capital of Magadh kingdom (modern Bihar).

At the present time these springs are in an unhygienic condition and it is suggested that, as in other countries, the Government or a public utility body might take over their administration as a going concern for the benefit of the community.

I wish to express my thanks to Lieut.-Col. A. D. Stewart, C.I.E., for his help and advice and for permission to use Prof. Schmidt's electrometer from the Institute of Hygiene and Public Health, Calcutta, for the spot analysis. Also my thanks are due to Dr. B. B. Brahmachari who gave me some facilities for conducting the investigation as well as to Prof. H. Ellis C. Wilson and Dr. Bashir Ahmed for their help and suggestions.

I desire to thank Dr. A. K. Sen, Director of the Bengal Public Health Laboratories, Calcutta, for permission to publish this paper.

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THE MIDDLE-AGED PATIENT, AND LATER

(A LECTURE TO POST-GRADUATES)

By G. T. BURKE, M.D., F.R.C.P. (Lond.)
LIEUTENANT-COLONEL, I.M.S.

Professor of Medicine, Lucknow University.

I HAVE chosen this subject, not only in order to bring before us those ailments from which the patient of 40 and over is especially prone to suffer, but also in order to emphasize the importance of arresting, so far as possible, in the younger patient those processes, many of them degenerative, which may lead to the results which we so often find ourselves unable to alleviate.

Middle age should find the individual at the summit of his mental powers, and still not far past that of his physical attainments: how long he will remain at this level depends to the greatest degree on how he has developed and treated himself during his earlier years, and to a much less extent on the sort of tissues he has inherited from his forebears. The decline into old age should be a very gradual one, and not a steep descent.

Age is a question of the individual, who may be an old man of forty, or a young man of sixty or older: it is useful, thus, to know how old the patient actually is, that we may judge how far his condition is likely to be pathological. 'A man is as old as his arteries' sounds a trite saying, but it is a true one if for 'arteries' is read tissues generally. I have been amused by the student who, having described his first patient as 'an old man of forty', when he has realized his teacher's age gives his description of the next as 'a young man of fifty'!

An important point to realize about the elderly patient is that there is a general blunting and slowing down of reactions: pain may be much less obvious; the pulse not accelerate to such a degree with fever; the fever itself not be appreciated so much, and perhaps require to be taken in the rectum for any degree of accuracy; the bowels act less well and yet constipation does not cause the harm it does in the young. Chronicity is the general rule in the affections of old age.

Leonard Williams points out that, while the assimilation of an adequate diet is most important in the period of growth and development, during the later years of life it is output or katabolism that is most essential. We can realize this in the many cases of inadequate kidney function due to degenerative changes which we meet with in late middle and old age. Intake and assimilation are of relatively less importance, and it is a mistake unduly to urge on the old a diet with which they feel they cannot deal. It is not what is eaten but what is digested which counts, and the elderly relative who needs 'supporting' in the opinion of his anxious women-folk is often supported out of

the world altogether! As the individual passes towards the stage of the 'lean and slippered pantaloons' he needs a closer approximation to the diet of the 'puling infant', in which guise he entered on the stage of this world. The quantity as well as the quality of the food should be cut down, and milk, fruit, fresh vegetables, and eggs take the place of the stimulating diet, meat and spices, of former years. It is not only the aged who need this caution, for the majority of men over the age of forty eat much more than they require, and it is true that a great many individuals dig their graves with their teeth. It is within the experience of many of us that members of long-lived families are usually small eaters, and also that small eaters tend to be more active. In this country the overeating is usually of carbohydrates, and results in the high proportion of glycosurics which is met with, and which complicates the treatment of the other maladies of late life.

The digestive system is the site of disorder not infrequently after middle age. Gastro-duodenal ulcers are liable to occur, and there is the constant possibility of malignancy to be thought of. Beware of an intractable diarrhoea in an old person; it may signify the presence of a 'new growth', or it may be the expression of nature's attempt to compensate for renal inadequacy and to stave off uræmia. A chronic colitis is another cause for diarrhoea which, however, is not confined to those past middle age: examination of the stools is of course called for, and careful palpation of the abdomen for evidence of contracted or dilated colon, while a rectal examination, with proctoscopy if necessary, may show ulcerative colitis or the existence of a new growth in the pelvic colon or rectum. Cancer of the colon may cause either diarrhoea or constipation, and the development of either, in an individual approaching or past middle age, should lead to a most careful survey of the patient generally. Blood may be present—it usually is obvious in cancer of the lower part of the large bowel—but may be 'occult' and require the guaiac test to demonstrate it. If you wait for severe colic and visible peristalsis, or for actual obstruction, the opportunity for successful treatment may have gone, and emaciation, also, will point a poor prognosis. Of the use of x-rays in diagnosis I need lay no emphasis; it is often of the greatest importance. Fortunately involvement of glands and secondary deposits in other organs usually occur fairly late, and success frequently follows removal of the growth.

Renal inadequacy as a cause for diarrhoea I have also mentioned; this is only one of the symptoms for which a sufferer from this condition may consult his doctor. Chronic Bright's disease has various warning signals, and disregard of them can only lead to disaster. Of these danger signals a chronic diarrhoea is one; another is headache—a protean and too often

disregarded symptom, especially as minor degrees of hypermetropia or hypermetropic astigmatism may cause headache as presbyopia gradually approaches. The headache may only be felt on rising in the morning, or may be of any degree of severity; if associated with high blood pressure it may be throbbing in character, and if there is any uræmia there may be drowsiness, nausea or vomiting, and retinal changes. Instead of headache, this patient may complain more of giddiness or fullness and noises in the head.

A third symptom is directly connected with the renal system itself: the patient may complain of nocturnal frequency of micturition. Here we have to differentiate from the frequency of enlargement of the prostate, not usually difficult, for there is no obstruction or delay, and there is polyuria. The patient may come to the physician *via* the ophthalmologist, to whom he has gone for failing vision: the prognosis in his case will be worse in all probability—he will be in better case, however, than the misguided person who visits an oculist for glasses. Attacks of bronchitis, even of 'asthma', or symptoms of cardiac decompensation, may be the reason for consultation, and we have most of us met the diabetic patient who knew that he had glycosuria but who proves to have renal disease as well.

The discovery of early renal inadequacy is a call for a most careful search of the patient for any possible causal factor. Every possible source of infection should be tackled, especially teeth, tonsils, and bowels. Measures to promote activity of the skin include warm bathing and moderate exercise; fresh air must be unstinted, and close and stuffy atmospheres therefore avoided. Diet should be reduced in quantity and in stimulating qualities, nitrogenous foods being cut down, and fresh fruits and green vegetables substituted. An occasional day in bed on water or a milk diet, or longer if the blood pressure is rising, has a good effect, and absence of worry should be insisted on. Measures to promote elimination by the bowel are to be taken, and may include a weekly dose of 'blue pill' at night followed by a saline purge the next morning. Of attempts to lower blood pressure I will only say that, beyond the point at which the kidneys demand pressure for functioning, harm will be done: for continued use of potassium iodide holds a high reputation, as it probably has an eliminating effect also.

I need not consider here the other forms of nephritis, as the patients are too young to come under our present subject.

From the renal system it is an easy step to the cardiovascular, a step taken only too easily by the patients of whom we have been talking. Not by any means all our cardiac patients of middle or later years, however, originate as renal cases: hyperpiesis, arteriosclerosis, syphilis, and cardiac degenerations all contribute

their quota, often in combination. Here it is important to recognize the causes which may be at work. Arteriosclerosis, apart from those cases where it is secondary to kidney disease, and using the term in its widest significance, may result from primary high blood pressure, as occurs in individuals who live hard, eat hard (digging their graves with their teeth, as I have said), or play hard, and who, perhaps, have an inherited tendency to raised pressure; it may be part of a general involution of old age, and as such may occur much earlier in certain individuals; it may be the result of, or be encouraged by certain intoxications, such as lead, gout, and possibly tobacco; or it may follow syphilis.

That high blood pressure is a factor in the production of sclerosis of vessels is evident from its usual absence from the pulmonary vessels, except in those cases where the pulmonary pressure is increased, as in mitral stenosis; and by its particular occurrence at points of strain, such as the arch of the aorta and the orifices of branches. Or the cause and effect may be reversed, and high blood pressure follow sclerosis of the vessels. The typical group of symptoms of arteriosclerosis is the occurrence of giddiness and failing memory in a middle-aged man with thickened arteries, a large heart, and an accentuated aortic second sound; the further symptoms fall into three groups:—renal, of which I need say no more, except that in the primary arteriosclerotic kidney the same degree of polyuria of low specific gravity urine does not occur; cardiac, including fibroid heart, failure, irregularities, angina, and thrombosis; and cerebral, including giddiness, headache, loss of memory, mental changes, transient symptoms from spasm, and cerebral hæmorrhage and thrombosis.

Other symptoms which may arise are due to insufficient blood supply to various parts such as intermittent claudication in the limbs, when exertion causes pain and tingling or even cramps and paresis, with coldness and congestion; or cramp-like pains in the abdomen, to be distinguished from the pains of lead-colic or tabes. In arteriosclerosis the prognosis depends mainly on the condition of the kidneys, for a course has to be steered between the Scylla of renal failure and the Charybdis of vascular rupture or cardiac failure.

Chronic myocardial failure, or degeneration, or the fibroid heart, is essentially dependent on disease of the coronary arteries, and the factors in its production are arteriosclerosis (and its causes), renal disease, age, and syphilis. The commonest symptoms first to call attention are:—shortness of breath, up to cardiac asthma; fainting; cold sweats; headache; loss of memory or mental failure; epigastric distension; cardiac pain; abnormal rhythm. There may be sudden death without any previous symptoms. The signs are correspondingly indefinite, and usually there is arteriosclerosis, cardiac enlargement, a

roughened mitral first sound, and an accentuated aortic second sound: the pulse is often slow and there may be an abnormal rhythm.

Of the symptoms of myocardial failure, the most typical are cardiac asthma and cardiac pain. The 'asthma' consists of attacks of nocturnal dyspnoea, and must be distinguished from not only renal or uræmic asthma, but also true bronchial asthma and the spasmodic attacks of shortness of breath which occur so frequently in advanced emphysema and chronic bronchitis. In the cardiac condition there may be little in the lungs at first, but with failure the degree of congestion may simulate the bronchitic condition, and the cardiac responsibility for the attack may be overlooked. Cardiac pain itself requires care in diagnosis, as to whether true angina pectoris is present or not. Angina should be defined as 'severe paroxysmal cardiac pain, related to effort, and having a characteristic and definite distribution'. It occurs, as a sign of myocardial exhaustion, as one of the symptoms of heart failure; and also as an association of coronary disease, pointing to coronary narrowing or occlusion, the symptoms of the last-named condition, however, being somewhat different from those of angina.

The characteristics of true angina are:—(1) The presence of an exciting stimulus, usually effort, but sometimes emotion, gastric distension, or cold; (2) a sudden paroxysmal onset, reaching its maximum almost at once; (3) severity varying from substernal tightness to a constricting crushing pain with imminent fear of death; (4) precordial, or epigastric, to begin with, radiating thence to the left axilla, arm, wrist, and inner two fingers, or to left side of neck, shoulder and jaw, or, in rarer cases, to similar situations on the right side; (5) the attitude and behaviour of the patient, who is afraid to move, waves away assistance, is ashen in colour, and breathes in a constrained way, probably with hand pressed over his heart; and (6) the sudden or rapid termination of the attack, often with passage of urine or flatus, leaving the patient exhausted, and perhaps the subject of recurrent attacks over a period of hours. Sudden death may occur in the attack.

Compare this with a coronary thrombosis: (1) The onset often when at rest, or in bed at night; (2) an agonizing pain, worse than anything ever experienced before, with much the same distribution as in angina; (3) a patient writhing in agony, restless, even walking about, anxious, sweating, ashen or even cyanosed, and dyspnoeic; (4) the pain not spasmodic, but constant and lasting even several days, and no relief except from morphia, a pulse rate over 100 and commonly irregular. Certain cases of thrombosis suffer from urgent dyspnoea, and to a much less degree from pain.

Into the further signs of these conditions I will not go now, but I will mention the other causes of apparent cardiac pain from which they have to be distinguished. These are: (1) fibrositis of the inter-costal muscles, if of the left side—sometimes a panniculitis also simulates; (2) pleurisy, which is related, of course, to respiration, and therefore may superficially be related to effort; (3) gastric pain, which may be substernal or precordial; but which does not radiate as angina does, and while angina may come on after food it usually requires exertion.

or emotion as well to excite it; (4) exhaustion of the respiratory muscles, a not uncommon cause of pain in heart failure, as the excessive respiratory strain tires the muscles; and, as the respiratory disturbances are often most painful while lying on the back, the so-called 'angina at rest' may be caused; and (5) false angina, commonest in women, and symptomatic of a lowered threshold to pain in neurasthenic individuals. These conditions must be excluded before the other serious diagnoses are made. For the relief of the pain, angina spells nitrites, and coronary thrombosis spells morphia, and morphia in large and repeated doses.

Another sign I have mentioned of chronic myocardial disease is abnormal rhythm, most commonly extrasystole or block, partial or complete. Extrasystole of itself is not a sign of cardiac disease, and it must be considered together with other indications, but heart-block is a definite sign of value as pointing to the state of the rest of the heart muscle. There is little clinical sign of disease of most of the muscle, and hence a sign of disease of part of it—the conducting tissue—is valuable because the disease process is rarely confined to that tissue. Of itself, if localized, the lesion may cause no disability; apart from the danger of Stokes-Adams' attacks, where the heart may not start again, a heart with complete block established may carry on very well, but almost always the trouble elsewhere causes a progressive failure, or, most commonly, sudden death. Various drugs have been tried in order to abolish the tendency to Stokes-Adams' attack; opinions differ, but probably barium chloride in doses of 3 grains a day, 1 gr., *t.d.s.*, or ephedrine, $\frac{1}{2}$ gr., *t.d.s.*, may be of use.

In patients past middle age, the electrocardiogram is undoubtedly a better judge of the condition of the muscle than a clinical opinion, and, therefore, in cases of doubt, if it is possible, such a record should be obtained. The same does not apply to younger patients, where a careful clinical examination will yield as good results.

In the treatment of failure due to chronic myocardial degeneration, I have been impressed with the value of glucose. In urgent cases, where absorption is likely to be deficient, it may be given intravenously as 20 c.cm. of a 20 per cent solution, following on a venesection when such is required: in most cases it is enough to give it by the mouth, either as such, or as sugar which many Indian patients will take quite well, and insulin in doses of 5 units 15 minutes or so before a dose of 2 ounces of glucose is often of help. When there is acidosis, and if there is acetone present in the urine, glucose should be given in large amounts—quite $\frac{1}{2}$ lb. (one *pao*) a day.

Where there is much œdema the best diuretic to use is one of the new mercurial derivatives, neptal or salyrgan, which acts better if given

simultaneously with one of the acid-forming salts, such as ammonium chloride, which we use here in doses of 30 gr., *t.d.s.* Digitalis in cases of myocardial failure is apt to be disappointing, and should be used with caution, especially if there is partial block; when complete block is present good results may be obtained from the direct action of the drug on the ventricular muscle, without any slowing of the heart rate.

The utility of massage must not be forgotten in restarting efficient circulation in the extremities, and in the convalescent stage it will be combined with active as well as passive movement.

Enough of the cardiovascular system. Let us now, for a short time, consider the diseases which are likely to be met with in the older patient, in the respiratory organs. The bronchi and lungs in the latter half of life are very prone to infection. A typical group of statistics gives the incidence of pneumonia per 100,000 of population, ages 15 to 45 as 100, ages 45 to 65 as 263, and 65 and over as 733. Well has it been called 'the old man's friend', removing him by a sharp and not too painful illness instead of his becoming the subject of a long-drawn-out degenerative process. Chronic bronchitis looms large in our view, with the sequels of emphysema and consequent right-heart failure. Much can, I am sure, be done, with the co-operation of the patient, to avoid the early stages of naso-pharyngo-bronchial infection which on the one hand may lead to pneumonia and on the other result in structural changes in the lungs and chronic disease: prophylactic vaccines have great utility in this connection, and should be given in such graded doses as to avoid much reaction.

The elderly patient with pulmonary trouble often presents himself to us in the guise of 'asthma', and then it is necessary, as I have already said, to exclude the possibility of a cardiac or renal cause for the spasmodic shortness of breath, which done, it will probably be found that the bronchial spasm is the result of infection, and the accompaniment of a certain degree of emphysema, and is not due to true asthma. The clearing up of the infection is then the most important point in treatment, and a vaccine, autogenous or mixed, may help. General health is of the greatest importance, removal of any infection elsewhere, avoidance of constipation, and of a heavy meal shortly before bedtime. With acute bronchitis, bed early in the attack is a golden rule with old people; a bed rest may be employed. I need not go into the variations in the drug treatment necessary, but inhalations often give much relief.

I have not touched upon the question of enlarged prostate, which belongs to the surgeon, nor will you expect me to talk to you of the symptoms and changes produced by the

onset of the menopause in women. I will only remind you that these symptoms go on for a much longer period than is often supposed, and that similar symptoms of more or less marked degree occur also in man, at a later age.

In conclusion, let me urge upon you to advise your elderly patients and friends to

keep an active mind; to take up, as their bodily activities diminish, some congenial task or occupation whereby their interest and intellect may be kept alive, and thus to avoid sinking into that death-in-life which is nothing but a burden to the individual himself and to his relations.

Medical News

RAWALPINDI MEDICAL ASSOCIATION

The following resolution was unanimously passed at the Rawalpindi Medical Association meeting held on the 22nd January, 1936, and was telegraphed to the private secretary to His Excellency the Viceroy of India at New Delhi:

'The Rawalpindi Medical Association beg to offer the expression of sorrow on the death of our beloved sovereign King-Emperor George V and request you to kindly convey to Her Majesty the Queen Empress and the royal family our deep, respectful and loyal sympathy'.

STATE MEDICAL FACULTY OF BENGAL

FELLOWSHIP EXAMINATION—TITLE (F. S. M. F.)

1. It is hereby notified for information of the medical profession that the State Medical Faculty of Bengal has instituted the above higher examination equivalent to the doctorate of the universities by which the profession will be able to secure a coveted distinction.

2. The examination of the diploma of Fellowship is held either in medicine or in surgery and may be held once a year.

3. The examination shall be written, oral, practical and clinical.

4. Every candidate must either be a member of State Medical Faculty or possess a qualification or qualifications in medicine and surgery recognized by the Governing Body as equivalent thereto. Such qualification or qualifications must have been obtained at least two years before the examination.

5. Candidates in medicine will be required to specialize in one of the following groups of diseases, viz:—Diseases—

- (1) of the nervous system and mental diseases,
- (2) of the skin,
- (3) of the heart and circulatory system,
- (4) of the respiratory system,
- (5) of the digestive system including diseases of the liver, or

(6) of the urinary system, or

(7) tropical diseases.

Candidates in surgery will be required to specialize in surgery of one of the following description, viz:—
Surgery—

- (1) of the eye,
- (2) of the ear, nose and throat,
- (3) of the skull, brain and spinal cord,
- (4) obstetrical and gynaecological surgery,
- (5) of the bones and joints including orthopaedic surgery, or
- (6) of the urinary and generative system.

N.B.—For further particulars apply to the Secretary, State Medical Faculty of Bengal, Grosvenor House, Calcutta.

TRAINING OF WOMEN FOR CITIZENSHIP OVERSEA

Chairman and Treasurer.—Cyril Norwood, M.A., LL.D., President of St. John's College, Oxford.

Executive Committee.—R. E. H. Baily, C.B.E., Mrs. John Coatman, M.A., Lady Davson, O.B.E., Mrs. S. Neville-Rolfe, O.B.E., A. P. Newton, M.A., D.Litt., B.Sc., F.S.A., and M. J. Rendall, C.M.G., M.A., LL.D.

1. A non-residential course lasting ten weeks arranged by the Joint Committee of the Empire Citizenship Training Council and the Imperial Studies Committee under the aegis of the Royal Empire Society.

2. The course will start in London on 1st May, 1936, and will comprise a description of the History, Constitution and Races of the Empire, courses on Household management, and an insight into Social Services with an indication as to how these are adapted for conditions overseas.

3. An experienced whole-time tutor will be in charge.

4. Candidates should apply to the Secretary, Training of Women for Citizenship Oversea, The Royal Empire Society, 17, Carlton House Terrace, London, S.W.1, from whom information may be obtained.

5. Inclusive fee for the course, £12-12-0.

Current Topics

Pharmacological Aspect of Digitalis Therapy

By A. FRAENKEL, M.D.

(Abstracted from the *Lancet*, Vol. II, No. 16, 1935, p. 1101)

DIGITALIS AND STROPHANTHIN

The intravenous administration of strophanthin has made it possible to study the effect of digitalis upon the course of these processes in man with methods as exact as those used in experiments on animals. Only patients with severe dyspnoea have to be excluded from such investigations. Now recent experiments

leave no room for doubt that the main effect of digitalis in heart failure is an increase in the stroke volume and a change in the distribution of blood resulting from the increased circulation rate. Such an effect can be obtained with no other drug. The absence of appreciable effect on the healthy, as on the diseased heart when functionally compensated, and its appearance after minute doses in decompensation, may perhaps be explained in part by the intramuscular development of a specific sensitivity to digitalis in this latter group. For it is known from Weese's experiments that the intravenous injection of the glucoside is followed by the fixation of about 10 per cent of the dose by the heart:

or emotion as well to excite it; (4) exhaustion of the respiratory muscles, a not uncommon cause of pain in heart failure, as the excessive respiratory strain tires the muscles; and, as the respiratory disturbances are often most painful while lying on the back, the so-called 'angina at rest' may be caused; and (5) false angina, commonest in women, and symptomatic of a lowered threshold to pain in neurasthenic individuals. These conditions must be excluded before the other serious diagnoses are made. For the relief of the pain, angina spells nitrites, and coronary thrombosis spells morphia, and morphia in large and repeated doses.

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STATE MEDICAL FACULTY OF BENGAL

FELLOWSHIP EXAMINATION—TITLE (F. S. M. F.)

1. It is hereby notified for information of the medical profession that the State Medical Faculty of Bengal has instituted the above higher examination equivalent to the doctorate of the universities by which the profession will be able to secure a coveted distinction.

2. The examination of the diploma of Fellowship is held either in medicine or in surgery and may be held once a year.

3. The examination shall be written, oral, practical and clinical.

4. Every candidate must either be a member of State Medical Faculty or possess a qualification or qualifications in medicine and surgery recognized by the Governing Body as equivalent thereto. Such qualification or qualifications must have been obtained at least two years before the examination.

5. Candidates in medicine will be required to specialize in one of the following groups of diseases, viz.:—Diseases—

- (1) of the nervous system and mental diseases,
- (2) of the skin,
- (3) of the heart and circulatory system,
- (4) of the respiratory system,
- (5) of the digestive system including diseases of the liver, or

(6) of the urinary system, or

(7) tropical diseases.

Candidates in surgery will be required to specialize in surgery of one of the following description, viz.:—Surgery—

- (1) of the eye,
- (2) of the ear, nose and throat,
- (3) of the skull, brain and spinal cord,
- (4) obstetrical and gynaecological surgery,
- (5) of the bones and joints including orthopaedic surgery, or
- (6) of the urinary and generative system.

N.B.—For further particulars apply to the Secretary, State Medical Faculty of Bengal, Grosvenor House, Calcutta.

TRAINING OF WOMEN FOR CITIZENSHIP OVERSEA

Chairman and Treasurer.—Cyril Norwood, M.A., LL.D., President of St. John's College, Oxford.

Executive Committee.—R. E. H. Baily, C.B.E., Mrs. John Coatman, M.A., Lady Davson, O.B.E., Mrs. S. Neville-Rolfe, O.B.E., A. P. Newton, M.A., D.Litt., B.Sc., F.S.A., and M. J. Rendall, C.M.G., M.A., LL.D.

1. A non-residential course lasting ten weeks arranged by the Joint Committee of the Empire Citizenship Training Council and the Imperial Studies Committee under the aegis of the Royal Empire Society.

2. The course will start in London on 1st May, 1936, and will comprise a description of the History, Constitution and Races of the Empire, courses on Household management, and an insight into Social Services with an indication as to how these are adapted for conditions overseas.

3. An experienced whole-time tutor will be in charge.

4. Candidates should apply to the Secretary, Training of Women for Citizenship Oversea, The Royal Empire Society, 17, Carlton House Terrace, London, S.W.1, from whom information may be obtained.

5. Inclusive fee for the course, £12-12-0.

Current Topics

Pharmacological Aspect of Digitalis Therapy

By A. FRAENKEL, M.D.

(Abstracted from the *Lancet*, Vol. II, No. 16, 1935, p. 1101)

DIGITALIS AND STROPHANTHIN

THE intravenous administration of strophanthin has made it possible to study the effect of digitalis upon the course of these processes in man with methods as exact as those used in experiments on animals. Only patients with severe dyspnoea have to be excluded from such investigations. Now recent experiments

leave no room for doubt that the main effect of digitalis in heart failure is an increase in the stroke volume and a change in the distribution of blood resulting from the increased circulation rate. Such an effect can be obtained with no other drug. The absence of appreciable effect on the healthy, as on the diseased heart when functionally compensated, and its appearance after minute doses in decompensation, may perhaps be explained in part by the intramuscular development of a specific sensitivity to digitalis in this latter group. For it is known from Weese's experiments that the intravenous injection of the glucoside is followed by the fixation of about 10 per cent of the dose by the heart.

If, as has been done by Clark, we calculate the amount of strophanthin fixed per gramme of heart muscle, the astonishing fact is revealed that 1 g. adsorbs at most 0.002 mg. of the drug. If, moreover, we assume that a compensated heart has undergone an increase in weight by 50 per cent, and if we further take into account the fact that one-tenth of the lethal dose has a detectable effect upon the diseased heart exhibiting a high sensitivity to digitalis, we arrive at the conclusion that the concentration in which digitalis acts is of the same order as that found in the case of the hormones.

To the question whether or no there arises a specific increase in sensitivity to digitalis when the heart fails, no definite answer can as yet be given, owing to lack of clinical and especially experimental evidence. Weese points out that since the minute output of the 'decompensated' heart is diminished, the possibility arises of a greater proportion of the total strophanthin injected reaching the coronary system and being fixed by the heart muscle.

The fact that disagreement in the theory of strophanthin therapy is associated with unanimity as regards the practical success of treatment with the drug, shows that much still remains to be accomplished by clinical investigation. Unfortunately we still lack methods which are easily applicable in everyday practice for the estimation of stroke volume and minute output of the true that the physician finds a possible indication of these values in measurements of systolic, diastolic, and pulse pressures. In addition x-ray photography and measurement of the venous pressure (the latter rightly emphasized by Lewis) are at his disposal for assessment of the degree of heart failure and of its therapy. Here, however, I should like to invite attention to two further methods of value in this connection.

First, the daily measurement of body-weight excludes the possibility of neglecting the extrarenal loss of water—an error which easily occurs if only the urine output is determined—and indicates by direct means the day on which the removal of œdema fluid is completed, and so the time when the minute volume has in all probability reached its optimum. Exact observation of this kind enables us to avoid overdosage and at the same time, by gradation of the dose within 0.1 mg., to control accurately the rate of fluid removal, and so to delimit precisely the period allowed for complete elimination of the retained water; a realization of the therapeutic ideal of obtaining optimal effects from the smallest doses. This is illustrated in the case of a patient who showed no improvement from treatment with digitalis by mouth.

After a preliminary observation for two days, treatment with strophanthin was begun, and during the period of treatment a decrease in body-weight from 86 kg. to 71 kg. occurred. This effect was obtained by 14 injections of K-strophanthin, the initial dose being 0.3 mg. and thereafter doses of 0.4 mg. were given. A total of 5.2 mg. of strophanthin was 0.15 mg. therefore, the daily dose of strophanthin was 0.5 kg. per day. and the amount of fluid eliminated was 0.5 kg. per day. Such is a characteristic case of heart failure therapy with intravenous injection of strophanthin, the removal of œdema fluid and the course of recompensation being completely under control. At the end of treatment with strophanthin an injection of salyrgan was given, and this had no influence on the excretion of water. The giving of a provocative dose of salyrgan in such cases indicates whether or no latent œdema exists, and so supplies information of great importance in their after-treatment.

Since analogous conditions have not as yet been investigated in animals, we have already overstepped the border of experimental pharmacology. Indeed, we are immersed in the pharmacology of man immediately we ask for information from a patient as to the onset of the drug's action. And this brings us to the second means of gaining an insight into the functional state of the heart. In illness which, in the light of subsequent treatment, is shown to respond to digitalis, almost every

patient, irrespective of his position in life, feels and comments upon a favourable reaction to the first injection, provided the dose which has been chosen is not too small. The patient uses the word 'leicht'—linguistically similar and conceptually identical in both English and German—and he expresses in this way a feeling of happiness for the relief he has found. This 'subjective indicator' either appears once only, or it may be met with after subsequent injections. Its disappearance is characteristic of the completion or approach of compensation; its reappearance signifies a new failure, threatened or already present. The cause of this 'subjective indicator' has not yet been ascertained; all that seems to be certain is that it precedes the demonstrable increase in the minute volume. The presumption is that it is the expression of the first return to normal in the tension of CO₂ and O₂ in the respiratory centre, resulting rapidly and indirectly from the increased circulation rate. This self-observation of the patient receives its full importance from the fact that, unlike with morphine, therapy with strophanthin is not complicated by the phenomenon of tolerance. The necessity of increasing the dose or reducing the intervals between successive injections, which may occur in the case of intravenous strophanthin therapy, always depends upon either an anatomical or a functional deterioration in the heart as a result of progressive disease.

PRINCIPLES OF STROPHANTHIN THERAPY

The essence and limitations of therapy with intravenous injections of strophanthin can be formulated in the following way:—

(1) There is no degree and no phase of cardiac insufficiency from the beginning of the disease—often difficult to gauge—to the stage of extreme abnormality in the distribution of blood along with its accompaniments, which does not respond to the intravenous administration of strophanthin. Only the compensated heart on the one hand or the dying heart on the other not yet responds or no longer responds to this treatment. Indeed, it is possible to draw conclusions of the greatest value for diagnostic and prognostic purposes from the absence of response as well as from its presence, and in the latter case from the amount of drug and the period found necessary for functional recovery to occur.

This can be seen from the collection of a group of cases characterized especially by large hearts with myocarditis—transverse diameter from 19 to 23 cm.—and by very marked œdema. In some of these cases hypertension, in some irregularities in rhythm were present; others were free from either of these complicating factors. All were treated with series of injections of strophanthin, only after treatment with digitalis by mouth had proved unsuccessful. The doses of strophanthin were so chosen that the patients lost weight to a degree not greater than 1 kg. per day. Those patients who needed little strophanthin and displayed a marked diuresis lived long. Those on the other hand who received more strophanthin and yet eliminated their retained water more slowly died within a shorter period.

(2) In strophanthin therapy it is necessary to adhere to exact dosage, and to take careful records of the effects of each and every dose, just as in experiments with animals, and even if the treatment be continued for a long time. This demand—a matter of course in the laboratory—is, in the application of most therapeutic measures, for the most part neglected. Such a procedure, being based on scientific methods, raises strophanthin therapy to the level of controlled experiment, and furnishes at the same time a guarantee of its safety.

Although the clinic considers the oral administration of digitalis to be contra-indicated in certain cases of valvular defect and disordered rhythm, the systematic use of strophanthin by the intravenous route finds successful application in such cases too. The ætiological factor becomes of less importance; the decisive

factor is the functional impairment of the heart with its accompaniments of venous stasis and deranged distribution of blood.

I should like at this stage to invite attention to two points which can best be illustrated by reference to individual cases. In mitral stenosis, in which treatment with digitalis by mouth is often difficult and even dangerous, it is possible to obtain an ideal therapeutic effect if the doses of strophanthin are small and are given at proper intervals of time. Moreover, it is by no means exclusively cases of heart failure with auricular fibrillation or frequent and regular pulse which respond to strophanthin administration. Complete success is met with even when the pulse is infrequent and regular. In these cases the muscular effect of strophanthin is more prominent than the vagal.

(3) The prognosis of cardiac insufficiency has entirely changed since the possibility has arisen through the use of strophanthin not only of enlarging the field in which treatment with digitalis is indicated, but also of making success in the treatment of certain cases more assured. The features of this disease have been further allayed since we have had at our disposal a suitable mercurial diuretic which can be given intravenously. The heroic treatment of heart failure with calomel and digitalis by mouth, dating back to Fothergill, is now replaced by one which involves the administration of salyrgan, and so supplements the effect of strophanthin in this disease. Salyrgan acts on the tissues as well as the kidneys, and possesses the outstanding advantage that it can be given intravenously, and so in an exact dosage, which when properly chosen ensures freedom from danger. The appropriate combination of both remedies, not simultaneously or on the same day even, but one after the other on different days, makes possible the removal of oedema of the severest degree as well as that of very long standing. Drainage of the legs, so irksome to patients, is avoided, and reappearance of oedema in large part prevented. Cardiac oedema is a secondary disease which can be avoided if the failing heart is treated early enough, and if, after recompensation has become established, treatment is continued for a still longer period, the duration of which must be determined in each case by circumstances. In illustration we may quote the following case:

A patient, 60 years old, with arteriosclerosis and hypertonia, a large heart (transverse diameter 18.6 cm.) and auricular fibrillation, had shown signs of heart failure for a year. His physician treated him with digitalis, giving small doses at first and large later. No improvement was detected, but instead signs of overdose (pulsus bigeminus) supervened. After a short period of observation without medication, the loss of water was initiated by salyrgan and the failure of the heart abolished by strophanthin. It may be added that we were able to avoid the appearance of pulsus bigeminus as well as other signs of toxic action, in spite of the fact that the patient received in the course of 60 days 25 injections of strophanthin of about 0.3 mg. each, amounting to 6.3 mg. of the drug. In addition a total of 16 c.cm. of salyrgan in 12 injections was given. The elimination of water resulted in a decrease of 21 kg. in body-weight, a fact which shows that the normal weight of the patient had increased by as much as 40 per cent during the development of the failure. Notice should also be taken of the fact that the elimination of oedema fluid under the influence of the diuretic salyrgan, acting on the tissues and kidney, occurs characteristically in steps, whereas during the quantitatively controlled treatment with strophanthin this loss proceeds steadily.

From the first experiments with digitalis on the frog's heart to the more recent and complicated investigations on the action of digitalis on the heart and circulation of the mammal, the path has been long and tiresome. We must not be surprised, therefore, if the practical application of pharmacological research to the reduction of the suffering and to the prolongation of the lives of patients with heart disease takes long to

achieve. This attempt, however, to evolve a rational digitalis therapy from a knowledge of experimental pharmacology, and to describe the peculiar importance of the intravenous route in connection with the glucoside which is most suitable for this mode of administration, is not to be regarded as a revolt from the customary empirical use of preparations of digitalis by mouth. By no means Withering's therapy retains its position in the treatment of heart failure where such is of not too severe a degree or of not too long a standing.

Artificial Pneumothorax in the Treatment of Lobar Pneumonia

By F. G. BLAKE, M.D.

M. E. HOWARD, M.D.

and

W. S. HULL, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CV, 9th November, 1935, p. 1489)

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The four most frequent clinical effects reported are prompt relief of pleural pain, relief of dyspnoea, diminution, often striking, in the general toxic phenomena of the disease, and a critical fall in temperature shortly after the induction of artificial pneumothorax, sometimes permanent, though often only temporary. Clear evidence is lacking, however, that pneumothorax treatment serves to cure the disease, since in the majority of the recorded cases in which treatment was not started until the fourth day of the disease or later, approximately one-half failed to exhibit any apparent modification of the natural course and outcome of the disease, and prompt critical recovery without relapse appears to have occurred in only one of nine cases treated on the second day of the disease and in only three of fifteen treated on the third.

SELECTION OF CASES

In the selection of cases for treatment it seemed to us of importance to direct our efforts primarily to a study of the effect of artificial pneumothorax on the early stages of pneumonia. Consequently all patients with unilateral pneumonia admitted to the medical service of the New Haven Hospital not later than the third calendar day of the disease during the period covered by this report have been treated without selection, twenty-four in number. The remaining eighteen patients, in whom treatment was begun on the fourth or fifth day of the disease, were arbitrarily selected.

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The technique employed has been that commonly used. Immediately following the preliminary examination of the patient an x-ray film of the chest is taken to confirm the clinical diagnosis and to make certain that the pneumonia is unilateral. Following a preliminary dose of morphine, artificial pneumothorax treatment is started. Treatments are ordinarily given with the patient in the lateral position with the pneumonic

side up, since the intrapleural pressure established with the patient in this position does not become lower in any other position that the patient may subsequently take. Air is allowed to flow in under the negative pressure developed during inspiration until the intrapleural pressure has nearly reached the atmospheric level, when a slightly positive pressure is used. Pressure readings are taken after every 50 to 100 cubic centimetres of air have been introduced, the treatment being continued until the desired intrapleural pressure is attained. If (for any reason) it is found necessary to have the patient in the prone or sitting position during the treatment, the mean pressure should ordinarily be raised to about 4 cm. higher than the desired level in the lateral position since the pressure will fall approximately 4 cm. whenever the patient changes from the prone to the lateral position with the pneumothorax side up. If, during the treatment, the patient complains of a dragging or pulling pain, adhesions may be suspected and the treatment may be interrupted. Following the first, second or third treatment, as seems indicated, another x-ray film is taken to determine the degree of collapse of the lung and the presence or absence of pleural adhesions.

The procedure followed with respect to the frequency, rate and volume of pneumothorax treatments has been evolutionary and empirical and will be illustrated by early, intermediate and recent cases in the series.

In the beginning it was hoped that two initial treatments of approximately 300 to 500 c.c. each, given six hours apart and followed, if necessary, by a third treatment eighteen hours later, might be sufficient to accomplish the desired result. This procedure was found to establish a mantle pneumothorax without selective collapse of the involved lobe and to raise the mean intrapleural pressure to -3 to -0.5 cm. It appeared to be satisfactory in the first two cases treated. By the time nine cases had been treated, however, it had become apparent that this procedure was inadequate, since, following temporary clinical improvement, relapse was found to occur as the intrapleural pressure fell, provided antibodies had not appeared in the blood, as was subsequently found to have happened in the first two cases.

In view of these results the procedure was changed. From three to five initial treatments were given at intervals of approximately four hours in order to establish a mean intrapleural pressure in the neighbourhood of $+1$ cm. to $+2$ cm. and to induce a complete collapse of the whole lung on the involved side, provided adhesions did not interfere. The first three treatments were ordinarily of 500 to 800 c.c. each. Subsequent treatments were given at irregular intervals in an effort to maintain a positive intrapleural pressure and complete collapse of the lung until permanent recovery seemed assured or further treatment inadvisable. Gradually a further modification was tried, in which the initial treatment was increased in amount and the early refills were given at somewhat less frequent intervals. At the same time, with the purpose of avoiding temporary increase in dyspnoea, the rate of introduction of air was cut down from an average rate of approximately 30 to 40 c.c. per minute, which had been previously used, to an average rate of 10 to 15 c.c. per minute. At this slow rate, large amounts of air can apparently be administered without difficulty.

The volume of air required to raise the mean intrapleural pressure to $+1$ cm. to $+2$ cm. has been found to vary greatly from case to case and cannot at present be correlated with any measurable factors, nor can it be predicted. Ordinarily it will range from 1,800 to 2,400 c.c. The time required for the large initial treatment consequently will vary. If 1,800 c.c. is given and it is administered at an average rate of 12 c.c. per minute, the treatment will take two and one-half hours to complete. The rate of fall in intrapleural pressure following the first treatment has been found to be very variable and unpredictable, ranging from 0 to 1.33 cm. ap hour in the cases studied. The rate of fall following

refills is likewise variable, though commonly less rapid than after the first treatment. Consequently the frequency and volume of refills required to maintain a positive intrapleural pressure and complete collapse of the lung are at present empirical. In our experience not more than four to eight hours should be allowed to elapse between the first and second and the second and third treatments, decision as to time in the individual case depending in part on the pressure level attained at the end of the first treatment, in part on the volume of air previously introduced and in part on the clinical response. The use of subsequent refills depends on the course of events in the individual case. In general, an effort is made to keep the intrapleural pressure positive until recovery seems assured.

EFFECT OF PNEUMOTHORAX TREATMENT

Review of the forty-two cases treated suggests that the most important factor influencing the results, apart from the method of treatment used, is the duration of the disease at the time treatment is instituted. Consequently our cases have been divided into four groups, according to duration. Group A comprises four cases in which treatment was begun within twenty-four hours after onset in the preconsolidative stage; group B, nine cases in which treatment was started between twenty-four and forty-eight hours after onset in the early consolidative stage; group C, fifteen cases in which treatment was initiated between forty-eight and seventy-two hours after onset with hepatization more or less advanced, and group D, fourteen advanced cases of more than seventy-two hours' duration when treatment was begun. Another important factor apparently influencing the results in groups B and C at least is the absence or presence of pre-existing fibrous pleural adhesions; consequently these two groups have been subdivided accordingly. Since the effect of artificial pneumothorax in relieving some of the distressing symptoms of lobar pneumonia, such as pleural pain, restlessness, dyspnoea and toxæmia, has been well described by others and our experience is in harmony with theirs, this subject will not be elaborated here and attention will be directed towards the effect of pneumothorax therapy on the course, duration and outcome of the disease.

GROUP A: Treatment begun within twenty-four hours after onset.—It will be seen that all four patients were treated with large initial amounts of air, the mean intrapleural pressure being raised to the positive level. Complete collapse of the whole left lung occurred in all but one case in whom adhesions between the parietal and the visceral pleura over the uninvolved left upper lobe prevented collapse of this lobe. All four patients recovered promptly without further extension of the pneumonia and without complications, except for a transient acute psychosis in W. L., a patient suffering from severe chronic alcoholism.

GROUP B: Treatment begun between twenty-four and forty-eight hours after onset.—In the first six cases without adhesions all but one, who was treated early in the series, received initial treatments adequate to raise the mean intrapleural pressure to atmospheric level or above and to collapse the whole lung on the involved side. All showed prompt clinical improvement with relief of distressing symptoms. Recovery was rapid in one and apparently accelerated in all but R. F., who nevertheless was much improved symptomatically. None showed further spread of the pneumonia. In two cases sterile pleural effusions developed that were sufficiently large to warrant withdrawal by aspiration. No notable effect on the symptoms or course of the disease resulted in the three cases in which pleural adhesions were present, presumably because the adhesions interfered with adequate collapse of the involved lung. Three patients in group B showed a transient bacteræmia following the institution of pneumothorax therapy, apparently without ill effect.

GROUP C: Treatment begun between forty-eight and seventy-two hours after onset.—Of the six patients

without pleural adhesions four recovered promptly by crisis, two showed temporary improvement but relapsed, with a spread to the opposite side. Three, however, showed antibodies in the blood on the fifth, third and sixth days, respectively, so that early recovery may have been the natural crisis rather than related to the pneumothorax treatment. Among the nine patients with fibrous pleural adhesions no beneficial therapeutic effect was observed, with one possible exception.

GROUP D: Treatment later than seventy-two hours after onset.—Artificial pneumothorax exerted no apparent effect on the duration or outcome of the disease in this group of advanced cases. In fact, even temporary symptomatic relief was observed in only one patient. In none of the six cases in which bacteremia was present did the treatment terminate the blood stream infection.

COMMENT

The observations on the use of artificial pneumothorax in the treatment of forty-two cases of lobar pneumonia that have been presented appear to indicate that the procedure is of definite therapeutic value but only under certain limited conditions; namely, (1) when the volume of air introduced into the pleural cavity is sufficient to raise the mean intrapleural pressure promptly to a level of +1 to +2 centimetres with the patient in the lateral position, pneumonic side up, resulting in complete retraction of the affected lung; (2) when the frequency of refills is sufficient to maintain the mean pressure at this level and the lung is retracted until the danger of relapse is past; (3) when treatment is instituted early in the disease; i.e., certainly within less than seventy-two hours after onset, probably within less than forty-eight hours in most cases; (4) when the pleura is free from adhesions that interfere with retraction of the involved lung. The signal importance of the time factor is clearly shown in figure 10, which summarizes the results in the forty-two cases treated.

Experimental observations bearing on the mechanism by which artificial pneumothorax exerts its apparent effects have been presented elsewhere and will not be discussed in detail here. In brief, they show (1) that respiratory motion of the involved lung can be abolished by artificial pneumothorax, provided the amount of air introduced is sufficient to cause maximum retraction of the lung on the treated side, (2) that antibody production is not demonstrably accelerated by pneumothorax therapy, and (3) that there is little evidence to support the view that relief of a hypothetical bronchial occlusion takes place following pneumothorax treatment. Consequently the theory that the effects of artificial pneumothorax depend on immobilization of the infected lung would appear to be the most acceptable one at present.

CONCLUSIONS

1. Artificial pneumothorax, when administered so as to induce and maintain complete collapse of the lung on the involved side, would appear to be a useful therapeutic procedure in the treatment of lobar pneumonia but only when used early in the disease, preferably within twenty-four hours after onset.
2. There is no evidence to support the view that it is of curative value later than seventy-two hours after onset.
3. Further trial of artificial pneumothorax in lobar pneumonia is desirable and should be carried out before any statistical analysis of results obtained is warranted.

Hæmorrhage and Anæmia in the Newborn

By REGINALD LIGHTWOOD, M.D., M.R.C.P., D.P.H.
(From the *Medical Press and Circular Supplement*,
23rd October, 1935, Symposium No. 4, p. xi)

In the neonatal period hæmorrhage and anæmia are closely linked. The bleeding and coagulation time,

and the number of platelets conform to the average standards which are given as the 'normals' for all ages, and quantitative analyses of the substance concerned in clotting indicate that during the first four days every factor favours increased coagulability. Nevertheless, in practice somewhat wide variations are not uncommon, and a tendency to bleed excessively must be recognized as an occasional feature of the first two weeks of life. Moreover, a little bleeding may be a serious matter when the infant's blood volume is small and when the bone marrow is already working at high pressure to supply physiological requirements. Further, when hæmorrhage causes anæmia, a vicious circle may arise, for anæmia in turn may interfere with the mechanism responsible for the arrest of bleeding.

SPONTANEOUS HÆMORRHAGE

Soon after birth hæmorrhage from the umbilicus may be seen. It is due to slipping of the ligature, which will require to be re-tied; or a ligature, too thin, may cut through the delicate tissues of the cord. It is advisable, therefore, to use a stout ligature and to apply it at such distance from the umbilicus as to make re-ligature possible. From the second day until after separation of the cord, secondary hæmorrhage due to infection may occur. Its treatment is (1) preventive and (2) immediate. The former consists in thorough asepsis and the proper care of infection if it occurs. The latter lies in the application of pressure. This may be effectively carried out by means of a long needle passed transversely under the umbilicus. Pressure can then be exerted by a figure-of-eight of coarse silk wound round the needle. Small bleeding granulomata may be touched with a stick of silver nitrate. To confer a measure of passive resistance to infection, an intramuscular injection of 5 to 10 cubic centimetres of the mother's whole blood may be given.

Melæna neonatorum, the hæmorrhagic disease of the newborn, is a well-defined clinical entity, probably due to some qualitative alteration in the blood. The nature of this alteration is not known. Shallow duodenal ulcers have been found in a few fatal cases, but their causal relationship has not been satisfactorily established, for they have also been found in cases without hæmorrhage. The number of platelets is within normal limits; in some of the patients the coagulation time is prolonged. In the majority of cases the bleeding comes from the gastro-intestinal tract, consequently melæna is the chief symptom, though hæmatemesis alone or in association with melæna is frequently seen. More rarely the hæmorrhage takes its origin from some other mucous surface or from the umbilicus; if from the latter, signs of infection should be sought. The onset of melæna neonatorum is from the first to the third day, though occasionally it may be delayed, and cases beginning as late as the tenth day have been recorded. Quite healthy-looking infants may be affected.

In so far as untreated cases may prove rapidly fatal, this melæna must be regarded as a medical emergency. On the other hand, mild, untreated cases often recover spontaneously, though liable to anæmia at a later date. Few diseases are more easily treated. As soon as the condition is recognized, 10 to 15 cubic centimetres of human whole blood (the serum does equally well, but the added trouble of removing the cells is not necessary) should be injected intramuscularly. Sometimes more than one injection is required; when this is the case, the second injection should follow within two to four hours. A total of 30 cubic centimetres in all may be required. There is direct evidence that the bleeding may abruptly cease about ten minutes after a successful injection. The blood need not be grouped; citration may be carried out, but only as a convenience to prevent clotting in the syringe. (For citration, dissolve a two-grain tablet of sodium citrate in 3 cubic centimetres of water and add 1 cubic centimetre to 10 cubic centimetres of blood). The injection is made into the muscles on the outer side of the thigh, avoiding the napkin area. Afterwards the infant

must be kept warm and quiet in its cot for twenty-four hours. Three hours after effective treatment, feeding is begun again with due caution. Occasionally a severe hæmorrhage, or delay in giving the treatment, results in a state of anæmia dangerous enough to demand blood transfusion, which is indicated if the blood count falls below three million cells; but the intramuscular injection must not be delayed during preparation of the transfusion. In convalescence, iron deficiency may become unmasked, and to prevent this, reduced iron, one-half grain, powdered, mixed with sugar and placed on the infant's tongue, three times a day, is valuable.

All other causes of spontaneous hæmorrhage are rarer than the foregoing. Purpura may be seen, either the thrombocytopenic variety or secondary purpura due to septicæmia. Hæmophilia may show itself when an hereditary affected infant is circumcised. Leukæmia is a very rare cause of bleeding in the newborn.

Hæmorrhage associated with jaundice.—An increased tendency to bleed is a notable feature of jaundice whatever its cause, so that it may arise in any of the icteric conditions encountered in the neonatal period. In *icterus gravis neonatorum* spontaneous hæmorrhage is one of the recognized causes of death. It may be gastro-intestinal, umbilical, subcutaneous or intracranial. Similarly in *congenital obliteration of the bile ducts*, *sepsis neonatorum* and *congenital syphilis* with jaundice, bleeding may occur and, indeed, prove fatal. There are also two kinds of severe neonatal infection distinguished by the eponyms of *Winckel's* disease and *Buhl's* disease; both used to have rare epidemic incidence until the introduction of aseptic technique in obstetric practice, and now they have virtually disappeared. *Winckel's* disease, also called epidemic hæmoglobinuria, was a septicæmic condition due to umbilical infection in which grave toxæmia caused jaundice, rapid blood destruction, hæmoglobinuria and hæmorrhages. The combination of jaundice and cyanosis induced different observers to mention the occurrence in their cases of a somewhat characteristic bronze or slaty-grey colour. *Buhl's* disease was a fatal gastro-enteritis featured by jaundice, hæmorrhage, œdema, intense fatty changes in the viscera and enlargement of the liver. In these syndromes an hepatitis was the cause of the jaundice and hæmorrhage was a manifestation of toxæmia.

Suprarenal hæmorrhage may occur in the newly born, and the condition, when bilateral, is incompatible with life. Characteristic are the presence of high temperature and rapid respiration, with normal lungs, so that differential diagnosis includes pneumonia. A mass may be felt at the adrenal site; convulsions, petechiæ, purpura, erythematous rashes and jaundice may later appear.

ANÆMIA IN THE NEONATAL PERIOD

We have much to learn in regard to the ætiology and pathology of the clinical varieties of anæmia, some common and some very rare, which occur in the neonatal period. Their classification is therefore difficult. Provisionally, the following scheme may be followed:

Category	Examples
I. Hæmolytic anæmias.	Icterus gravis neonatorum; hæmolytic anæmia of the newly born; anæmia of neonatal syphilis, and family acholuric jaundice.
II. Anhæmopoietic anæmias.	Hypoplastic anæmias due to bone marrow insufficiency, iron-deficiency, infections.
III. Mixed types, both hæmolytic and anhæmopoietic.	Anæmia of prematurity; erythronoclastic anæmia resulting from infection in the newly born.
IV. Leukæmias	

Hæmolytic anæmias.—It is well known that during the first seven to ten days of life the majority of

infants show evidence of a physiological hæmolysis (physiological icterus) which is explained by the theory that the full time unborn infant, depending on placental respiration, requires a higher proportion of red cells and of hæmoglobin than will be necessary after pulmonary respiration becomes established. The mechanism by which the excess of circulating erythrocytes is broken down has not been explained.

An hyperchronic anæmia developing rapidly in the first few days after birth is the rule in the already mentioned *icterus gravis neonatorum*. Its hæmolytic character is shown by a positive indirect van den Bergh reaction (the direct reaction may also be positive at the height of the jaundice), a high colour index, brisk regeneration of blood and, in fatal cases, hæmosiderosis of the viscera. Some would see in this condition an exaggeration of the physiological hæmolysis of healthy neonates, while others have preferred to postulate a primary disorder of erythropoiesis. Pathologically many of the cases show widespread extramedullary hæmatopoiesis in the liver, spleen and other tissues. Nucleated red cells are numerous in the blood (erythroblastæmia). The death rate from anæmia and jaundice, and sometimes from hæmorrhage or infection, is high, and destructive changes in the nuclei of the medulla and basal ganglia (kernicterus) also contribute to the mortality. Treatment may be directed (1) towards an attempt to check further blood destruction. This is essayed by intramuscular injections of human blood serum; 5 to 15 c.c. given as early as possible and repeated daily until improvement begins; (2) towards prevention of an issue fatal through anæmia by the use of whole blood transfusions.

Similar in type is the condition of *hæmolytic anæmia of the newly born*, which may be related to icterus gravis, but differs from it in the absence or mildness of jaundice and the lesser number of nucleated red cells in the blood. It is unusual to discover the cause of this kind of neonatal anæmia, but sometimes an infection, e.g., severe neonatal syphilis, streptococcal or staphylococcal fever, is present; and the anæmia and hæmoglobinuria of *Winckel's* disease may be recalled.

Anhæmopoietic anæmias.—Defective blood formation in the neonate is seldom due to any known specific deficiency. For example unless the mother herself is the subject of severe hypoferrism, iron lack is rare at this age. On the other hand, we are ignorant of nearly all other possible causes. Scantiness of marrow tissue, the anatomical result of limited medullary bone space, which overcrowds and restricts the output of blood cells, suggests an attractive hypothesis. Certain cases may result from infection through depressed marrow function (inhibitory anhæmopoietic anæmia). For all our ignorance of their causation, clinically these cases are striking. A sudden pallor, without trace of jaundice or hæmolysis, comes a few days after birth ('congenital anæmia'). The van den Bergh reaction is negative and signs of blood regeneration are absent. Iron is without effect, and liver extract, though not of proven value, is worth trial. In all cases except the mildest whole blood transfusion is the only effective treatment. If after a time spontaneous regeneration begins the prognosis is good, but failing this the aspect of idiopathic aplastic anæmia is assumed and the infant dies.

Mixed types of anæmia.—It must be recognized that the causes of any one case of anæmia may be multiple; for example, during a pyogenic infection, hæmoglobin may be lost through secondary hæmorrhage, and subsequent regenerative activity of the bone marrow may be prevented by toxæmia. The *anæmia of premature infants* has a background equally complex. In them the ordinary physiological hæmolysis is apt to be excessive; then, from immaturity of the bone marrow, from defective iron storage and perhaps from other factors, subsequent erythropoiesis is delayed. For these reasons moderate hæmolytic anæmia is common in the premature's first few weeks, recovery from it is slow, and later, from about the third month, the effects of iron deficiency are increasingly evident. As a rule

the early increased hæmolytic must be left to run its course, but if, soon after birth, severe anæmia is present, blood transfusion will be of value. The period of hæmolytic and icterus being past, half-grain doses of reduced iron mixed with sugar may be given three times a day. It has been shown that some premature infants have a 'negative iron balance' during their first few months, so that these prophylactic doses of iron, incapable of preventing moderate anæmia from arising, will ensure that when the infant's ability to use iron increases there will be no shortage.

In certain (hæmolytic) cases, related on the one hand to hæmolytic anæmia of the newly born and to hypoplastic anæmia on the other, following an initial destruction of blood, regeneration temporarily or permanently fails; to these the comprehensive term *erythronoclastic anæmia* is applied. In the group with temporary failure, early blood transfusions are of the greatest value. They may keep the infant alive (substitution therapy) until the bone marrow becomes efficient some three or four weeks after birth, this state of efficiency being heralded by a spontaneous reticulocytosis.

Leukæmia.—Instances are on record of infants showing leukæmia at or soon after birth. In no case, though, has the mother suffered from the disease, nor has a leukæmic mother been delivered of a leukæmic infant, evidence against any possible infective origin for leukæmia. Leukæmia in the newborn does not differ materially from the same disease occurring at a later period of childhood except that the myelogenous types, so rare in children past the age of infancy, are encountered relatively more often. Difficulties have arisen in distinguishing severe hæmolytic anæmias with erythroblastæmia (icterus gravis, etc.) from neonatal leukæmias but the signs of hæmolytic in the erythroblastic syndrome (icterus, etc.), together with the cytology of the blood films, should enable leukæmia, which is much the rarer, to be easily excluded.

Recent Advances in Dietetics

By S. J. COWELL, M.A., M.B., F.R.C.P.

(From the *Practitioner*, Vol. CXXXV, October 1935, p. 384)

THE past year or two has witnessed an exceptional degree of interest on the part of the general public in problems connected with 'food values'. Only too often, however, this legitimate interest has had to be satisfied with half-truths or guesses at the truth. The relation of diet to human health and development is still only beginning to be understood. Modern principles of nutrition have been applied for so short a time to problems of human dietaries that it will not be possible for many years to judge what may and what may not be achieved by 'correct' feeding throughout the whole span of men's lives. As far as the medical profession is concerned there are two main aspects of dietetics which merit separate consideration. There is first the use of diet for the treatment of established disease and, secondly, the use of diet for promoting good physical development and lessening the predisposition to various diseases.

TREATMENT BY DIET

As regards the use of diet therapeutically, many of the most valuable recent advances have been in the direction of supplying dietetic factors the absence of which from the habitual diet has led to deficiency states or diseases. Such deficiency diseases, though often caused primarily by dietetic faults, are sometimes treated more satisfactorily by massive doses of the missing food elements than by natural foods containing those elements. Treatment by the former method can scarcely be distinguished from treatment on orthodox pharmacological lines, although the prevention of such diseased conditions can usually be assured by adjustment of the diet alone. A good illustration of this principle is to be found in the recent work which has

been done on nutritional anæmia, particularly by Professor L. S. P. Davidson and his colleagues in Aberdeen. Anæmia, often severe, was found by them to be widespread among the women of that city, and the evidence which they laboriously collected pointed to a deficient iron intake in the daily food as one of the chief determining causes. Treatment of the condition by a good diet containing natural foods comparatively rich in iron was slow and uncertain, whereas treatment by massive doses of medicinal iron was usually effective in quite a short time. Again, deficiency diseases are now recognized in people whose diets have not been lacking in any known food factor, the deficiency having arisen either from an acquired inability to absorb some specific food factor or from some breakdown on the part of certain tissues of the body which interferes with the normal metabolism of a specific food factor. Thus among the victims of chronic intestinal diseases 'secondary pellagra' has been recognized not infrequently and its origin is probably to be sought in mal-absorption of the pellagra-preventing substance or substances. Pernicious anæmia is an example of a secondary deficiency disease in which the fault lies not in an actual food deficiency, but rather in a defective mechanism in the stomach for elaborating from certain food elements the necessary specific substance which stimulates the formation of red cells. Such secondary deficiency diseases, though not always readily amenable to simple dietary adjustment, may be readily amenable to comparatively large doses of the appropriate factors.

This tendency to employ pharmacological substances in place of natural foods is met with in the treatment of chronic urinary infections. The high fat: low carbohydrate diet which has been used with considerable success in such conditions has already a serious rival. The therapeutic effect of this diet probably depends on the production and excretion in sufficient concentration in the urine of B-oxybutyric acid, and it is well known that for the attainment of this end the diet must be most rigorously controlled, usually to the patient's great discomfort. It is now claimed that equally good results may be obtained by keeping the patient on his usual diet and giving him by mouth mandelic acid, which apparently has the same sort of effect as naturally produced B-oxybutyric acid.

DIET AND PREVENTIVE MEDICINE

Although many of the modern discoveries of nutritional science have been divorced from their natural application by way of dietary control in so far as the treatment of disease is concerned, preventive medicine should still rely mainly on the selection of a suitable dietary of natural foods to foster that state of good nutrition which favours good physical development and raises the resistance of tissues to disease. This the general public is beginning to realize. There would appear to be no doubt whatever that a great deal of preventable illness is caused directly and indirectly by imperfect diet in countries such as ours where definite deficiency diseases are, with one or two exceptions, uncommon. The difficulty at present is to define with any certainty the requisite qualities of a good diet for human beings. To collect direct evidence on such a point is obviously an undertaking of enormous magnitude which would require an elaborate organization. To judge from the newspaper controversy which raged last year on the subject, the nutrition of human beings would seem to depend on supplying them with an exact number of calories and a precise amount of first-class protein. This was, of course, due to general ignorance; every medical man knows how variable is the amount of food consumed by different individuals in comparable states of nutrition. Probably the most practical suggestion which can be given to the ordinary individual in the present state of knowledge will turn out to be the advice to include regularly in his diet liberal quantities of the so-called protective foods, dairy produce, fresh vegetables and fruit, and to leave the rest of the diet to the individual taste.

SPECIAL CASES

In the case of certain classes of individuals, however, it is becoming generally recognized that more precise care in the choice of diet will have to be exercised if adequate nutrition is to be fully attained. Children, especially during their first years of growth, and women during pregnancy, require larger proportions of protective foods to ensure that their tissues do not suffer under the strain of rapid development to which they are subject. Certain food elements are already known which are particularly likely to be lacking in the ordinary diets of individuals belonging to these classes, their deficiency not uncommonly resulting in recognizable symptoms of disease. Among these may be included the mineral elements calcium, iron and iodine and certain of the vitamins. So much has been written about the calcium requirements of children that it is not necessary to stress it in any detail. A generous supply of calcium and phosphorus, together with a liberal supply of vitamin D, is essential for the perfect development of the bones and teeth of the child. Since milk is one of the richest sources of calcium among common foods, its provision for children on a liberal scale would seem to be justified for this reason alone, and the recent agitation for making it more readily available in poor households is all to the good. It is, however, not perhaps so generally realized that the pregnant woman, especially during the last few months of her pregnancy, requires large quantities of calcium in her diet to supply her rapidly developing foetus with all it needs without sacrificing her own valuable stores. A severe degree of calcium deficiency, particularly if combined with a deficiency of vitamin D, leads, as is now well known, to osteomalacia. But minor degrees of deficiency of these elements are almost certainly related to some of the common disorders associated with pregnancy. The spread of dental caries and the painful muscular cramps which are common features of pregnancy would appear to be due to this cause and to be preventable to a large extent by appropriate measures to make good the deficiencies. Evidence is now being accumulated to show that some of the toxæmias of pregnancy may be prevented by similar means, that is by increasing the supply of calcium and vitamin D.

The question of the iron requirements during infancy and pregnancy has recently been receiving a good deal of attention. Dr. Helen Mackay has worked out with great care the frequency of anæmia among infants in the East End of London and has shown that it is of nutritional origin associated with diminished resistance to infections and that it can readily be prevented or

cured by adding to the milk diet some simple preparation of iron. Of equal importance to this nutritional anæmia of infancy would seem to be the anæmia which is frequently associated with pregnancy. The common form of anæmia during pregnancy in this country, though almost certainly of nutritional origin and associated with a deficiency of iron in the habitual diet, is most satisfactorily treated by liberal doses of medicinal iron. The recognition of this anæmia and its correction by suitable treatment are rapidly becoming more widespread in this country, and it may be possible in the next few years to determine the extent to which some of the difficulties and dangers of labour and the puerperium are due to its presence.

A word may be said on the question of iodine deficiency. An adequate supply of iodine is still to be regarded as the key to goitre prevention, but there seems little doubt that successful prophylaxis depends largely on ensuring a sufficient supply of iodine to the developing foetus, which means giving the pregnant mother iodine in some form or other. The simplest method of doing this in our country is that sea-fish should be eaten once or twice a week during pregnancy.

These few examples may serve as indications of the special food requirements of pregnant women and children. It would be idle to pretend that the knowledge exists at present to enable ideal diets to be devised which would ensure perfect physical development of the human child and promote perfect health of the mother during her pregnancy, labour and lactation. Nevertheless, it is becoming more and more apparent that wise feeding plays a large part not only in determining the health of women throughout the period of their reproduction and in regulating the development of the growing child, but it is also capable of affecting the health of the offspring in later life. It is known that the body adapts itself in a remarkable way to changes of environment, including drastic changes in dietaries. Yet there is no doubt that dietary deficiencies in early life can lead to imperfections in the growth of the tissues which cannot be repaired in later life by the most perfect diet. Direct evidence on such a point as this is not easy to obtain when dealing with human material, but the truth of the general principle is suggested most strongly by a mass of experimental data obtained from animals. In the nature of things advances in knowledge of the full prophylactic effects on human beings of a good diet are bound to be slow. The general awakening of interest in the subject both within and outside the medical profession should foster the collection of further facts dealing directly with human material without which permanent progress in dietetics must be uncertain.

Reviews

THE MEDICAL GUIDE FOR INDIA AND INDEX OF TREATMENT.—By E. J. O'Meara, O.B.E., F.R.C.S. (Eng.), D.P.H. (Cantab.), Lieut.-Colonel (retd.). Fourth Edition. 1935. Published by Butterworth and Company (India), Limited, Calcutta. Pp. xv plus 1234. Illustrated. Price, Rs. 15. Postage, extra

A BOOK of this nature is a very difficult one to produce as it is impossible for one man to be sufficiently in touch with advances in every branch of medicine and surgery to produce an up-to-date account of everything, that is free from errors. This has to some extent been overcome by the author (or perhaps more correctly the editor) having obtained the assistance of many well-known authorities to contribute sections for which they are specially qualified; thus leprosy, malaria and cholera are well and briefly dealt with by Sir Leonard Rogers; indigenous drugs by

Colonel Chopra; obstetrics in the tropics by Lieut.-Colonel Green-Armytage; and acute abdominal conditions by Lord Moynihan to mention only a few of the special contributions.

Unfortunately, the same cannot be said of many of the notes not contributed by special writers, and in a book specially prepared for use in India one is surprised to find that certain sections of great importance in this country have been very inadequately dealt with. For instance under the heading 'Worms, intestinal' one finds a single prescription for roundworms, an out-of-date and unnecessarily complicated treatment for tapeworm, several treatments for threadworms and two prescriptions, one for roundworms and one for tapeworms in children. One has to search elsewhere for treatment of hookworm infection, and here again one finds that the subject is not properly up to date, for instance carbon tetrachloride is recommended on

account of its cheapness but no caution is given regarding its toxicity if used on unsuitable cases, and tetrachlorethylene is not mentioned. In still another place under 'Ankylostomiasis' a combination of one drachm of carbon tetrachloride and 15 minims of oil of chenopodium divided into three doses is recommended but the intervals between the doses are not given.

We now turn to another typically Indian disease, kala-azar, and find it is described in three-quarters of a page. The barest details of treatment with neostibosan are given. The various stibamine preparations are mentioned but no dose is given for them, and the greater part of the section is devoted to the use of sodium and potassium antimony tartrates which are much more fully dealt with than the newer and better drugs.

The section on classification of anæmia also lacks evidence of recent revision. Under 'B. Secondary (1) from arterial hæmorrhage' one finds wounds, hæmoptysis, hæmatemesis, uterine, intestinal, and hæmorrhoids, and (3) parasitic includes *A. duodenale*, *Bilharzia hæmatobia*, *Bothriocephalus latus* and *Filaria*. Presumably *Necator americanus* is not considered worth mentioning. In this classification pregnancy anæmia is not given but this is to some extent rectified by an account of this condition under both obstetrics and gynaecology.

Yellow fever is rightly not fully discussed but that 'there is always danger of it being introduced into India from the Far East' is a distinctly misleading statement, and it would have been better to omit all mention of the disease than to include such misinformation.

There is undoubtedly a great deal of valuable information in this book and its compilation represents a great amount of hard work but it is regrettable that so many errors have been allowed to remain for if it is used as their universal guide by the not very highly trained practitioners of which we have so many in India they will often find themselves disappointed or misled when referring to its pages for help, and so the book will largely defeat the commendable object with which it has been published.

It is difficult enough to make a book of this nature of reasonable size, in spite of most careful condensation, so it is hard to understand why four pages at the end have been devoted to the calendars for the years 1935-1938.

A book of this kind is almost a necessity for the isolated and not particularly well-qualified doctor who on account of lack of means cannot afford to buy journals and expensive books on special subjects, so it is hoped that in the next edition more care will be taken in its revision for the foundation is there of a valuable contribution to medical literature in India to fulfil a definite want owing to our special circumstances, but at present the superstructure is badly constructed.

P. A. M.

CLINICAL PARASITOLOGY AND TROPICAL MEDICINE.—By Dámaso de Rivas, B.Sc., Biol. M.S., M.D., Ph.D. In collaboration with Carlos T. de Rivas, B.A., M.D. 1935. Henry Kimpton, London. Pp. 367. Illustrated with 144 engravings and a coloured plate. Price, 22s. 6d.

THERE are now a number of useful books on tropical medicine available for the student and the practitioner, but, as on the whole this particular shelf in our library is not overcrowded, this new recruit was greeted with a certain amount of pleasure; it is feared, however, that the pleasure ended here.

On opening the book, the reviewer, with a natural though myopic instinct, turned to the subject of kala-azar; here he read, 'The mode of transmission of the parasite is not well understood, but it is believed that it is transmitted by contact, through abrasions or wounds in the skin. There is also a possibility that the parasite is transmitted by the bed-bug, flea, mosquito and other blood-sucking insects. Recently

Napier and his associates have demonstrated the transmission of kala-azar by *Phlebotomus argentipes*, and according to other investigators the disease, in China, is transmitted by a sandfly, *P. major*'. The first sentence, which the reader will naturally accept as the considered opinion of the writers, is a surprising one and it is doubtful if the belief is shared by anyone outside the University of Pennsylvania. The rest of his chapter is hardly more satisfactory; under the heading of treatment a statement made by the reviewer in 1924 is quoted and all the very important work that has been done since that date is entirely ignored.

The reviewer was somewhat discouraged by his first attempt, but he felt that it was unfair to judge the book on its treatment of one disease when it was possible that neither author had been within five thousand miles of the countries where this disease is endemic. He turned more hopefully to yellow fever as he noticed that one of the authors had been a pathologist in a hospital in Panama, but here he found no improvement; except for the statement that the disease is caused by a filtrable virus, there is scarcely a sentence in the section that could not have been written when King Edward the Seventh was on the throne of England. It is definitely stated that there is no personal prophylactic measure that is of any value, but it is naively suggested that as a general measure of prophylaxis yellow fever infected areas should be avoided; mosquito control is however mentioned.

In this same chapter, 'Diseases due to Filtrable Viruses', Oroya fever and, surprisingly, blackwater fever are included. No attempt is made to justify the inclusion of the last-named in this section and the subject is discussed in an orthodox manner with the necessary emphasis on malaria in the ætiology. There is one point however that calls for comment; in the middle of page 315 appears the following sentence:—'It is remarkable that an important disease, such as black-water fever was not recognized until recently. Lebean, about 1850, first described the disease in Magagascari'. Further down the page, against the quinine theory of the ætiology of blackwater fever, the following argument is used:—'Furthermore, blackwater fever must have been prevalent in Europe long before the introduction of cinchona bark on the continent'. Cinchona was introduced into Europe in 1632!

In the malaria section both atabrine and plasmochin are mentioned. The authors refer to the latter as if it were a substitute for quinine and condemn it as such, quoting some of the platitudes and cheap gibes that have emanated from others who have similarly failed to understand the properties of this drug, such as 'the need to combine quinine with plasmochin points its own moral' and 'advocates of plasmochin appear to fail to realize that the gametes [sic] or crescents also disappear eventually under quinine treatment'. 'Eventually' is a comprehensive word; but the authors of this book 'appear to have failed to realize' that quinine has no direct action at all on the gametocytes of *Plasmodium falciparum*, and that plasmochin without any quinine will cause their disappearance in 48 hours or less in nearly every instance.

No attempt is made to link up typhus fever with either Rocky Mountain fever or tsutsugamushi disease, nor, although the flea is mentioned as a possible transmitter of typhus, to differentiate epidemic louse-borne typhus and endemic flea-borne typhus (or Brill's disease). In the typhus section under the heading of diagnosis the statement is made that 'the Weil-Felix reaction—is believed not to be specific'. The statement will not be of much help to the student, and, if it conveys anything, it conveys the impression that the test is of no value in the diagnosis of this disease, whereas actually it is of very great value.

The whole book gives the impression of having been compiled from other textbooks and these not the most recent editions. Surely there are medical libraries in the University of Pennsylvania that take in journals, such as the *Tropical Diseases Bulletin*! In nearly every

section there is some very useful information well summarized, but intermingled with this there are so many misleading statements that the book will be of little value to anyone.

L. E. N.

AIDS TO MEDICINE.—By James L. Livingstone, M.D. Fifth Edition. 1935. Baillière, Tindall and Cox, London. Pp. viii plus 422. Price, 5s.

It is always a moot question how far books of the 'cram' variety should be encouraged; the answer is, that it depends partly on the book but mainly on how it is used and on the person who uses it. If the student uses it as his textbook, he may get through his examinations, but he will acquire a very imperfect knowledge of his subject; this is perhaps a greater indictment of the examination system than of cram books in general.

One can always rely upon the 'Aids' series books; one knows that at least the subject-matter will be accurate and reasonably up to date. We say 'reasonably' because of course it is essential that recent work that has not been generally accepted should not be included in a book of this kind, however certain the author may feel that in time it will be accepted.

This particular volume is no exception. Nearly all the sections that we read have obviously been revised recently. For example in the section on anæmia a classification on the lines of that suggested by Janet Vaughan has been introduced; but we cannot quite agree that the extrinsic factor is vitamin B₁₂. Recent work has shown that it is *not* identical with B₁₂, though it is associated with the vitamin B complex in many foodstuffs.

Even the sections on tropical medicine are far more up to date than they are in many textbooks on general medicine. In the malaria section atebirin and plasmodin are mentioned, though not pressed; this is as it should be. We were a little disappointed that tartar emetic is the only drug advocated for kala-azar, but if we were asked to write the treatment for black-water fever in one line, we do not feel that we could improve on 'Bed: warmth: fluids *ad lib.*; withhold quinine'.

It is a book that we can recommend to the student, and we believe that many practitioners would find it useful to aid their memory.

L. E. N.

FOOD AND BEVERAGE ANALYSIS.—By M. A. Bridges, B.S., M.D., F.A.C.P. 1935. Henry Kimpton, London. Pp. 246. Price, 16s.

IN 1933 Dr. Bridges wrote a book, *Dietetics for the Clinician*. A second edition was demanded in 1935. Both the first and the second editions of this book were reviewed favourably in this journal. The present volume is by way of being a supplement to this book. It consists mainly of tables relating to food values and allied subjects.

The main bulk of the book is taken up with a table that covers 117 pages, giving the nutritive—protein, fat and carbohydrate—and caloric values of some three thousand food substances. The system of giving the foods in terms of average portions is adopted; this facilitates easy calculation of a diet; however, at the same time the percentage occurrence of each element is given so that the food value of any definite weight of a substance can be worked out quickly.

Many of the substances in this table are proprietary food preparations and of course there are few of the common Indian foods; nevertheless, the table will be very useful to the worker in India, until such time as a similar table of Indian food substances has been prepared. Such a book cannot be expected for some years, as only a small proportion of the foods have so far been analysed.

Another table gives the mineral content of about 500 foods, and a third the vitamin content of a slightly smaller number. There are other useful tables, such

as those giving the average weight of children and adults of different ages and heights.

The tables are presented with introductory pages giving fundamental facts and very valuable information on the subject of dietetics. Certain figures that are quoted cannot of course be accepted for use in this country; for example, 100 grammes of protein is seldom included in the daily ration in India, though it is possible that it might be with advantage; on the other hand, it is doubtful if 150 grammes of fat would not be too much. However the author is never dogmatic and frequently points out that climate and other factors must always be taken into consideration.

The book is a very valuable and important contribution to the literature on dietetics.

L. E. N.

INFANT NUTRITION: A TEXTBOOK OF INFANT FEEDING FOR STUDENTS AND PRACTITIONERS OF MEDICINE.—By W. McKim Marriott, B.S., M.D. Second Edition. 1935. The C. V. Mosby Company, St. Louis. Pp. 431. Illustrated. Price, \$4.50

THIS book is written for the medical practitioner and student rather than for the sanitarian, the nurse, and child-welfare worker, though of course there is much information that the intelligent nurse will find useful. The ground covered by this book is usually included in any textbook on children's diseases, but here the subject is dealt with in more detail, and then again it is a subject which is undergoing such rapid changes that most practitioners will find this book a useful supplement to their textbooks.

This is a second edition of a book that was first published five years ago, but most of the sections have been completely rewritten, we are told in the preface and we can well believe it, as they all appear to be completely up to date.

The first chapter is on growth and development with charts and tables showing the average weight and the rate of increase of normal infants during the first year of life. Then follow chapters on the metabolism of different food substances which will be found very useful to those who have forgotten their physiology or whose knowledge is out of date. There is a good chapter on the vitamins and the conditions associated with their deficiency. Later chapters are on breast feeding, on artificial feeding, on the composition and character of cow's milk, on dried milks, on acid milks, and so on.

The second half of the book is devoted to different chapters on abnormal conditions, such as malnutrition, diarrhoea, coeliac disease, vomiting, constipation, prematurity, deficiency diseases such as rickets and scurvy, and common infections; in all those conditions diet plays an important part, both in the ætiology and in the treatment.

It is a book that we can thoroughly recommend to the pædiatrician and to the general practitioner.

THE TREATMENT OF DIABETES MELLITUS.—By Elliott P. Joslin, M.A. (Yale), M.D. (Harvard). Fifth Edition. 1935. Henry Kimpton, London. Pp. 620. Illustrated. Price, 28s.

LITTLE comment is necessary on the fifth edition of Professor Joslin's excellent treatise on the treatment of diabetes mellitus. It has always been a standard book of reference and in the present edition it fully justifies the claim.

The present edition has been revised and partly rewritten, some of the unimportant portions being omitted. Great stress has been laid on the ætiology and the prevention of diabetes which has been fully discussed in chapter III.

Chapter V dealing with the pathology and causes of death in diabetes has been written in collaboration with Drs. Warren and Root and contains very useful information and data which will amply repay perusal, so also chapter XXII dealing with surgery and diabetes.

The incidence of cardiovascular diseases in relation to diabetes has also been very ably discussed.

Chapter XXIV dealing with the subject of diabetes in children (and written, in collaboration with Dr. Priscilla White) is one of the most important and useful portions of the book.

The book on the whole contains a mine of useful information, being the product of Professor Joslin's life-long and intensive study of the problem of diabetes. It is a standard work which we feel sure will prove invaluable to practitioners and students all over the world.

J. P. B.

PRACTICAL ENDOCRINOLOGY: SYMPTOMS AND TREATMENT.—By M. A. Goldzieher, M.D. 1935. D. Appleton-Century Company Incorporated, New York and London. Pp. xxii plus 326. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited (Publishers), Calcutta. Price, Rs. 15-12

THIS is a book written in simple language for the benefit of the practising physician. Non-essentials have been omitted with the result that reference to any special point or syndrome is greatly facilitated.

The book begins with a short chapter on the morphology of the various endocrine glands, and the second chapter is devoted to a clear and concise account of their physiological action. This is followed by advice as to how a patient suffering from endocrine disease should be investigated and a description of the various laboratory procedures and tests that should be employed.

The major portion of the book is devoted to descriptions of the clinical characteristics of gland disorders, which will be found more useful to the practitioner than the usual method of describing the symptoms under the heading of the gland concerned, for in this book he is presented with the clinical appearance and reactions of the patient and then informed which gland or glands are usually affected.

Treatment is given at the end and is described under eighteen different headings which indicate the gland or glands at fault.

It is a thoroughly practical book and one that will be found useful for the general practitioner in assisting him to diagnose and treat successfully the obscure and not-yet-fully-understood diseases that arise from dysfunction of the endocrine glands.

If a criticism may be offered it is that the complete omission of all references is rather unusual and in this instance, when the author admits all his views are not generally approved of, it is perhaps rather unfair to other workers. This deficiency is offset by the claim that the considered views of an experienced worker in a difficult subject will be found of more use to the inexperienced physician than a discussion of the *pros* and *cons* from which he will have to make his own choice. This may be sound reasoning, but what is to happen to the physician who relies on this book and is faced with failure in a case after he has followed its precepts? It is felt he might have been given the opportunity of seeking for further knowledge elsewhere, by the inclusion of a few references to larger books.

P. A. M.

REPORTS ON CHRONIC RHEUMATIC DISEASES BEING THE ANNUAL REPORT OF THE BRITISH COMMITTEE ON CHRONIC RHEUMATIC DISEASES APPOINTED BY THE ROYAL COLLEGE OF PHYSICIANS. NO. I.—Edited by C. W. Buckley, M.D., F.R.C.P. 1935. H. K. Lewis and Company, Limited, London. Pp. x plus 159. Illustrated. Price, 12s. 6d.

TEN years ago it would have been impossible to refute the accusation that chronic rheumatism was a very neglected subject in Great Britain. During the last decade, however, the medical profession in that country has become more and more 'rheumatism

conscious'. The estimation made by the Ministry of Health that this disease alone costs the country over £17,000,000 per annum for industrial incapacity undoubtedly had a stimulating effect. One of the early signs of this increased interest in rheumatism was the establishment of the Red Cross rheumatism clinic in Peto Place and a more recent one is the appointment of a British Committee on Chronic Rheumatism by the Royal College of Physicians, with Sir Humphry Rolleston as chairman, a very representative body of members, including Lord Horder and Lord Dawson of Penn—the President of the College, and Dr. Copeman as secretary.

This book contains a foreword by the chairman, a note on the origin and work of the committee, a report of the nomenclature sub-committee, and a number of papers on chronic rheumatism in its different aspects, such as allergy and hypersensitiveness, biochemical investigations, focal sepsis, and histamin in the treatment of rheumatism.

The nomenclature report does not sound very practical, but the practitioner will find even this very instructive and from it he will learn much regarding the aetiology and symptomatology of the different types of rheumatism.

Rheumatism is not yet looked upon as one of the serious diseases of this country; this is possibly because its importance is overshadowed by other more acute and more easily preventable diseases. Most physicians, however, have some examples of chronic rheumatism in their practices, and this authoritative book should certainly find a place in medical libraries of any standing in India.

L. E. N.

RÖNTGENOLOGY: THE BORDERLANDS OF THE NORMAL AND EARLY PATHOLOGICAL IN THE SKIAGRAM.—By A. Köhler, Prof. Dr. med., Wiesbaden. Second English Edition revised by the Author. Translated and Edited by A. Turnbull, M.A., B.Sc., M.B., Ch.B. (Glas.). 1935. Baillière, Tindall and Cox, London. Pp. xvi plus 681, with over 400 illustrations. Price, 50s.

THIS is the second English edition of a world-renowned textbook on röntgenology. It is probably no exaggeration to say that it is the best-known and most authoritative general book on the subject in any language, and it has been translated into a number. There have been six German editions of which the first was published in 1910.

The suggestion is made in the author's preface that the aims of the book are rather different from those of the ordinary handbook on the subject, that is, that he has endeavoured to demonstrate by pictures, as well as by discussion in the text, the slight departures from normal detectable by röntgenographical examination which usually indicate the earlier signs of disease, rather than to show the gross divergences from normal which are more usually associated with advanced disease. Whilst admitting that the author has achieved his object very well indeed, we would point out that this surely should be the aim of all writers of handbooks that are meant to guide the practitioner, though for the student entering upon the practical part of his professional training it is perhaps advisable that he should be shown extreme instances in order that he may more easily obtain a visual impression of the whole disease process. We say that it should be the aim of all handbooks, but we quite admit that it is a common fault of writers on many subjects to portray, not only the last stages of a disease but even the extreme examples that are rarely seen in actual experience.

The author has avoided all specialist and all 'experimental' röntgenography and has confined himself to practices that are the daily routine of any röntgenological department attached to a general hospital; these are of course varied and numerous; he implies that when some of these more specialized procedures, such as ventriculography for example, are firmly established, they may be included in future

editions; others that he considers of doubtful usefulness he foretells will disappear from usage.

All the sections in the book appear to be good, but those on the stomach and intestines are particularly so; the descriptions are clear and adequately illustrated. There is not the excess of illustrations that are often just thrown at the reader without any particular selection having been exercised—probably put in because they happened to be in the author's collection—but each illustrates some point and often a number of points. Furthermore, the illustrations are not those superlatively clear ones that can only be produced with the most up-to-date and powerful apparatus, but they are of the clarity that we in India can usually achieve with the apparatus available in the larger hospitals here. The author says that most of the skiagrams have been taken with a twelve-year-old apparatus.

The translation has been a very literal one, and the language is in places very stilted and sometimes actually difficult to follow for this reason. Unnecessarily technical words are used; they are all words that can be found in the medical dictionary, but they could often have been replaced by words of everyday conversation without loss of precision. Surely it is unnecessary to say *anamnesis* when *history* is meant.

The author is not dogmatic and makes it quite clear that the röntgenological findings should be considered in conjunction with the history and the rest of the clinical findings; in some cases more importance will be attached to the röntgenological findings, in others less, but never should they be considered alone, or allowed to override definite contrary clinical findings.

Any physician who has to read röntgenograms will find an authoritative book of this kind almost essential, and we know no other that will serve his purpose so well.

L. E. N.

THE SPLEEN AND RESISTANCE.—By D. Perla, M.D., and J. Marmorston, M.D. 1935. Baillière, Tindall and Cox, London. Pp. xi plus 170. Price, 9s.

A GREAT deal of work has been done on the spleen during the last decade, but there still remains very much to be found out about it. It is difficult to explain why it is that in lower animals it seems an essential organ to protect them from the effect of certain infections, such as *Bartonella* in mice and *Plasmodium* in monkeys, and yet man can apparently get on quite well without his spleen.

Much of the recent work has been summarized and reviewed in this book. It is concluded with a very useful résumé of the subject; it is useful, but disappointing (through no fault of the writer), as, although we know a great deal about the spleen, we do not yet know the fundamental facts.

There is no reference to the recent work on monkey *Plasmodium* in India, though it has a very definite bearing on the subject, and in the list of 447 references some of the most important work done in England has not been included. Nevertheless, it is a valuable contribution to the literature on the spleen.

L. E. N.

HIGH BLOOD PRESSURE AND ITS COMMON SEQUELÆ.—By Hugh O. Gunewardene, M.B., B.S. (Lond.), D.M.R.E. (Cantab.). 1935. Baillière, Tindall and Cox, London. Pp. xi plus 172. Illustrated. Price, 7s. 6d.

THIS small book has been written to encourage the study of high blood pressure by the general practitioner. The observations recorded here are those made on 250 cases studied outside the hospital. In the first chapter the author rightly insists on the importance of the diastolic pressure as a true index of hypertension, and considers a diastolic of 90 and a systolic of 150 as upper limits of the normal for an adult. In the second chapter he ascribes hypertension as the commonest cause of heart disease. The third chapter is devoted

to the method of determining blood pressure; he rightly advocates the use of a mercurial instrument with a scale reading up to 300 and discards the aneroid machines. The systolic pressure is first roughly obtained by the palpation method, then the bag is deflated till the first click is heard. An illustration of the various subsequent phases has been given. In nearly all cases the point of disappearance of all sounds is 5 to 10 mm. below the actual diastolic, so that, if the latter number is added to the figure at the point of disappearance of sounds, a relatively accurate diastolic pressure is obtained when the different phases cannot be easily determined by the ear.

In the fourth chapter the author briefly describes the clinical types, with photographs, though of course appearances are not reliable. Following Clifford Allbutt he considers arterial hypertension under two main headings, the renal and hyperpietic, and finds non-renal hypertension rare under 30 years of age. From his clinical observations on the influence of occupation and living Dr. Gunewardene is of opinion that sedentary habits and overfeeding are chiefly responsible for essential hypertension, with heredity and diathesis only playing a subsidiary part in some. The normal pressure-regulating mechanism of the body is deranged in this condition, possibly by a dysfunction of the liver. The next part deals with the sequelæ of high blood pressure which usually involves the heart, the kidney, or the brain, or all. The author differentiates essential hypertension from chronic nephritis, in a tabular form. The influence of syphilis has been referred to; it plays little or no part in raising blood pressure.

Chapter IX deals with the occurrence of strokes which have been divided into two groups, motor and sensory. The author states that cerebral hæmorrhage does not occur with diastolic pressure of under 115 and advises the prognosis accordingly. This statement however requires confirmation. Chapter XV contains an account of acute œdema of the lungs. Apart from mechanical and inflammatory causes it is said to be the result of left ventricular fatigue under persistent hypertension. The prognosis has been discussed in chapter XVI and a table showing the causes of death in hypertension has been given. In the last chapter, on treatment, the author refers to general principles regarding rest, exercise, diet, septic focus, etc., in brief and agrees with the oft-repeated statement that drugs are not of much value, but he uses the sedatives and vasodilators when necessary. He has used patent medicines extensively, none of which proved more than financial burdens to the patients. He has obtained some good results by electrotherapy in selected cases. He believes that all cases of hypertension require treatment. There is an appendix showing a form used in the investigations of the cases, followed by an adequate index. Cross references throughout the text make reference simple and rapid.

R. C.

APHASIA—A CLINICAL AND PSYCHOLOGICAL STUDY.—By Theodore Welsenburg, M.D., and Katherine E. McBride, Ph.D. 1935. The Commonwealth Fund, New York. Pp. xvi plus 634. Illustrated. Price, 21s. Obtainable from Oxford University Press, Bombay and London

THIS book embodies the results of the most extensive study of aphasia ever undertaken and will long remain the standard work of reference on the subject in the English language, if not in any language. The authors' records cover the examination of 234 cases and an additional investigation of a further 80 cases. The 234 cases include (1) 60 cases of aphasia, (2) 22 cases of unilateral cerebral lesion without aphasia, and (3) 85 'normal' adults, i.e., selected hospital patients suffering from bone fractures, dislocations, hernia, arthritis and similar surgical conditions. This extensive and accurate employment of 'controls' is one of the main features of the book which gives it great value to the clinician as well as to the psychologist. The

aphasic group includes vascular, tumour and traumatic cases. The patients themselves were drawn from a wide variety of educational and occupational levels. The 'normal' controls represent a good sample of the average population.

For the selection of the subjects of the study, the following criteria were laid down:

1. They must be under sixty years of age so as to reduce the possibility of a picture complicated by senile changes.

2. The aphasic and the control cases of unilateral cerebral lesion without aphasia must not show any signs of a disorder known to affect mental functioning, e.g., psychosis; general paralysis, advanced cerebral arteriosclerosis; the 'normal' controls must likewise be free from any disorder known to affect mental functioning and they must also be free from any neurological disturbance.

3. All patients must have been English-speaking by birth.

4. They must have adequate sight and hearing.

The tests employed were for the most part the mental and educational achievement tests found useful for children. The typical adult performance of these tests was determined and then the aphasic responses were interpreted in terms of the normal adult performances. As there are no tests of language which do not depend on intellectual ability, the intellectual level of each aphasic tested was carefully taken into account.

In view of the complexity and variations of aphasic disorders, it was essential to have tests which provide for an examination of all the performances which may be affected. It was also necessary to provide tests for the detailed study of particular disturbances as well as tests to study the relative importance of specific speech defect along with other changes, i.e., the patient's method of work. The authors conclude that the most satisfactory classification of types of aphasia is not a logical but an empirical one. Hence they class the disorders in four main groups designated by the descriptive terms, 'expressive', 'receptive', 'expressive-receptive', and 'amnesic'.

The disturbances characteristic of the predominantly expressive disorder may appear in any degree of severity from a slightly abbreviated speech with occasional mispronunciations to an almost complete loss of all forms of spoken response. Cases of the predominantly receptive group show different degrees of limitation in the understanding of spoken language, differences extending from failure to appreciate the full significance of the verbal formulation down to a faulty understanding of single words or short sentences with some difficulty in perceiving the word-sound.

Patients with the expressive-receptive disorder are characterized by their serious limitations in all language performances since all language processes are so defective that no distinction can be made between the expressive and the receptive. The amnesic disorder consists essentially of a difficulty in evoking words as names for objects, conditions or qualities. The speech in amnesic aphasia, therefore, consists largely of familiar and colloquial expressions and of emotional and automatic responses.

In regard to the nature of all aphasic disorders, the conclusion reached by the authors is that although first and foremost a disorder of language, it is not limited to the language processes since it is shown to involve changes in the patient's reactions to practical, everyday problems and to matters of social response and relationship. As regards the seat of the lesions, certain definite statements can be made. First, the lesion must be within a given area, which includes both the anterior and the posterior part of the brain. By the anterior part is meant the pre-central convolution and the adjacent parts of the frontal lobe, the pre-motor area. The posterior part includes the inferior portions of the post-central and parietal lobes, the superior part of the temporal lobe, and the anterior part of the occipital. How much of the subcortex is involved it is impossible to say.

In the portion of the book dedicated to a historical survey of aphasia, the authors pay tribute to the outstanding contribution to the subject made by Hughlings Jackson, whose statement that, 'to locate the damage which destroys speech and to locate speech are two different things', is just as true to-day as it was seventy years ago.

The book is provided with a copious bibliography and a good index.

O. B-H.

INCOMPATIBILITY IN PRESCRIPTIONS AND HOW TO AVOID IT—WITH A DICTIONARY OF INCOMPATIBILITIES.—By Thomas Stephenson, D.Sc., Ph.C., F.R.S.E., F.C.S. Fourth Edition. 1935. The Prescriber Offices, Edinburgh. Pp. vii plus 62. Price, 6s.

DIFFICULTIES are sometimes experienced by both students and junior practitioners in writing prescriptions for patients in general practice; information in general books on materia medica is often too scanty to help them. Long association with students of pharmacy and chemistry has enabled Dr. Stephenson to write the present treatise in a most concise and lucid way, making it a most useful and practical guide for physicians who would avoid the many pitfalls encountered in prescribing. The present volume is nearly double the size of the original volume, and is thoroughly revised and brought up to date, and is strictly in accordance with the *British Pharmacopœia* of 1932 and the *British Pharmaceutical Codex* of 1934.

The first part of the book is devoted to the general principles of incompatibility and the second part is an invaluable addition consisting of the dictionary of incompatibilities dealing with both the official and non-official drugs, their doses, solubilities and incompatibilities. The book is well got up, handy and can be confidently recommended to those for whom it is intended.

R. N. C.

DEMONSTRATIONS OF PHYSICAL SIGNS IN CLINICAL SURGERY.—By Hamilton Bailey, F.R.C.S. (Eng.). Fifth Edition. Revised. 1935. John Wright and Sons Limited, Bristol. Pp. xii plus 287, with 341 illustrations, some of which are in colour. Price, 24s.

MR. HAMILTON BAILEY'S excellent little book on physical signs in clinical surgery has reached its fifth edition, and this is a fact which speaks for itself.

Though the book contains a few more pages than the previous editions, the author has resisted the temptation to enlarge it to any great extent. The increase in the number of pages being due for the most part to the addition of a few illustrations. Practically all the recognized signs used in clinical surgery are mentioned and most of them are admirably illustrated. The descriptions are brief, but at the same time lucid and quite sufficient to be clearly understood by the reader.

It is undoubtedly one of the best of the smaller works and should be in the possession of every student of medicine and surgery.

H. E. M.

MARTINI'S PRINCIPLES AND PRACTICE OF PHYSICAL DIAGNOSIS.—Edited by Robert F. Loeb, M.D. From the authorized translation by G. J. Farber, M.D. 1935. J. B. Lippincott Company, Philadelphia and London. Pp. xviii plus 213 with 30 illustrations in the text. Price, 9s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 6-12

'THIS little book, starting to-day on its way to those who intend to become physicians', are the opening words of the author's preface, and we would like to continue 'has fallen into the hands of one who, whilst suffering under the delusion that he has been a

physician for twenty odd years, has found much in it that he had forgotten or that he never knew'.

Innumerable books on physical diagnosis have been published, some too large, some too small, some too abstruse, some irritatingly simple, and many very satisfactory indeed; we will class this with the last group, without making any further invidious comparisons.

The scope of the book is the usual one, the diagnosis by the use of the eyes, ears, and fingers, unaided by any instrument other than the stethoscope, of disease conditions in the chest and abdomen. Within its scope the book is comprehensive, the subject is clearly and concisely presented, and it is in the form of a compact and strongly-bound volume, very suitable for the student's pocket. It is a book that we can strongly recommend.

THE NERVOUS PATIENT: A FRONTIER OF INTERNAL MEDICINE.—By Charles P. Emerson, M.D. 1935. J. B. Lippincott Company, Philadelphia and London. Pp. xiii plus 453. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 13-8

THE author has aimed at producing a reference book for general practitioners in this important side of their work and has succeeded admirably in his task. The writer is a physician and not an alienist and is at his best when describing the psychological manifestations of physical disease. The field he has attempted to cover is a wide one but he has touched upon most aspects of it, and has given, if not a profound study of the subject, a very practical discussion. This book should prove of great use to the practitioner.

Abstracts from Reports

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1933. VOLUME I. ON THE STATE OF THE PUBLIC HEALTH IN BRITISH INDIA AND SOME INDIAN STATES

[Continued from last issue, p. 115]

MATERNITY AND CHILD WELFARE

Maternity mortality.—Some idea of the causes of death may be gathered from the reports of certain hospitals for women summarized in the *Journal of the Association for Medical Women in India* (August 1934). The figures relate to the year 1933. The rate of death per 1,000 cases admitted in these hospitals was 24 per mensem. That for the Government Hospital for Women and Children, Madras, was 22. For comparative purposes the statistics of the St. Mary's Hospital, Manchester, are shown along with these figures. The death rate in Manchester was 9 per thousand cases. The rate would naturally be less in England even among cases admitted to hospitals. What is significant is the cause of the great proportion of the deaths in India compared with those at Manchester. Anæmia, eclampsia and puerperal sepsis account for deaths in a manner out of all proportion to these causes in the English figures. Hæmorrhages are the next most potent cause of loss of life. These deaths are in the majority of cases preventable and could be prevented if India had an adequate maternity service. Even in the capital city where there are three good women's hospitals and a large number of trained midwives and health visitors, the reported deaths from sepsis were 18 and those from eclampsia 10. In the city of Madras, boasting one of the finest maternity hospitals in the world besides several other good hospitals for women, the maternal mortality rate was 12 per 1,000 and 54 per cent of these deaths were said to be due to puerperal sepsis. In the city of Bombay 45 per cent of deliveries are conducted in hospital and 24 per cent by qualified nurses, leaving only 29 per cent to be attended by unqualified persons. The maternal mortality for the city is 8 per thousand. The figure for Calcutta is not available, but since fewer deliveries take place in that city than in either Madras or Bombay the probability is that there it is even higher.

In view of the absence of reliable statistics, it is impossible to state how many women in India die yearly during child-birth, but the number must be nearly one and a half lakhs, excluding deaths from complications of abortion which would swell the number still further. An epidemic disease assuming these proportions demands and receives attention from local authorities, health departments and the public itself. Deaths of women from preventable causes do not appear to receive the same attention. The explanation may

be partly that the facts are not known sufficiently, partly because mortality from child-bearing does not occur in epidemic form, but it must also be due to the too commonly held view that it is inevitable that some women must die during child-birth. 'Some women' in each area naturally become thousands when applied to the whole of India.

Maternity work and midwives training.—The maternal mortality rate is not likely to be reduced to any extent until the maternity service is improved. The problems involved in securing such improvement have been mentioned each year in this report, and the position does not seem to alter materially from year to year. Over a space of time, however, it is evident that slow progress has been made. The number of women who go to hospitals for delivery has certainly much increased, the Bombay figures being particularly striking. In urban areas, accommodation for maternity cases is often insufficient to meet the demands made on existing hospitals. Maternity homes, especially in Western India, are springing up. In towns also the services of trained midwives are in greater demand. This is so far satisfactory, but could the pace not be accelerated? With regard to urban areas it certainly could be. Municipal committees have the power and the opportunity to make advance and keen medical officers of health should stimulate their councils and committees to wipe out the disgrace of unnecessary loss of life occurring daily in the cities and towns of India. It seems possible that progress could be made in the following ways:

(i) The greater number of trained midwives now available makes it possible for committees to be stricter than formerly as to the qualifications of those practising in a given area. There is no longer any valid reason why women practising midwifery in the towns should not be forced to undergo training within a limited period of time.

(ii) A necessary concomitant of such action would be the keeping of a register of all midwives practising in the area, with ability to take action against those not registered.

(iii) A better class of women should be trained. The present economic situation in India is forcing women of the middle classes to take up gainful occupations and in various places they are offering for training.

(iv) In many places municipalities are already employing their own midwives. This service is capable of much extension and development. It ensures, or ought to ensure, good service for the public and a decent livelihood for the midwife. Such midwives should be whole-time salaried workers and fees should be recovered for their services from all who can afford to pay.

(v) One means of securing a good service is to have supervision of midwives. This can be effected by means of special posts as midwifery supervisors, or it can be done by means of health visitors. For good midwifery practice supervision is absolutely necessary.

(vi) In places where maternity homes exist, these should also be supervised to ensure that proper standards are maintained. Minimum standards should be enforced for such homes; these will safeguard the lives of the patients.

(vii) Antenatal work should be encouraged and in fact insisted upon at all welfare centres, hospitals or maternity homes maintained or assisted by municipalities.

(viii) An investigation of maternal deaths would assist in planning for improved service and measures to reduce maternal mortality.

These suggestions are perfectly feasible for many cities and towns and only courage is needed to put them into practice. It is realized, however, that any municipal committee must carry its community with it in initiating such reforms. The futility of providing a service for people who do not know how to use it and are not ready for it has been amply demonstrated.

When examination of the position in rural areas is made, the difficulties are found to be much greater. The villages are still in the clutch of the indigenous *dai*; necessarily so, since she is the only person who is available for help. It is urgently necessary to plan something for rural India, however, for approximately nine times as many children are born in villages as in towns in India. At present nature sees to it that normal cases mostly recover, though the morbidity through bad midwifery and subsequent lack of nursing care can only be guessed at. In abnormal cases the patients die, sometimes undelivered, of sepsis or shock, or, if distances permit, they are taken into headquarters hospitals, usually too late. Nowadays one hears a great deal of talk of rural uplift and women's needs have not been altogether neglected in these plans, but this problem of maternity work in rural cases has nowhere been attacked with the vigour it deserves. Schemes for giving village *daïs* a few weeks' experience in a hospital or lectures by medical men without any practical work will never meet the need.

Child welfare work.—It is now nearly twenty years since the first child welfare centres were started in India, and it may be useful to take stock of the present position. This work was introduced into India as a result of the example set in Europe without a great deal of reflection as to whether conditions in India were ripe for such a movement. In some ways they certainly were not. For example, the demand for cure or treatment was not satisfied as it apparently must be before preventive work has much chance of success. Furthermore, the raw material in the shape of nurses, or young women ready to be trained as such, needed to implement child welfare schemes, was not ready to hand. These were two major difficulties. Others were—a certain amount of ignorance and misunderstanding on the part of medical practitioners who had not watched the evolution of the movement in the West, the almost complete ignorance of the general public, hampering social customs such as early marriage and 'purdah' and the profound illiteracy among the women of India. Perhaps it was as well that the early pioneers did not stop to think of the difficulties in their path or they might never have started at all. These obstacles to the development of the work still exist, but, in spite of them, the number of centres has increased and there is a general appreciation of their usefulness even though the exact sphere of this usefulness is often imperfectly understood. Provinces such as the North-West Frontier Province and Assam are at the beginning of their child welfare career for in such provinces medical and maternity needs are still far from adequate. In other provinces, the movement is thoroughly established and is coming to be regarded as an essential part of public health work. The part played by the provincial

governments in the furtherance of child welfare work varies enormously.

The appointment of medical women officers as assistants to the Directors of Public Health is what is required to develop maternity and child welfare work adequately in every province. Child welfare work is best where there is provincial control and poorest where there is none. The fact that some provinces are providing funds and personnel and even training schools shows that they think this is a desirable form of public health expenditure. Others are apparently of a different opinion, but there can be no doubt of the correct course.

Health visitors and health training.—A rough computation of the number of health visitors working in India would give a figure of about 300—that is less than one per million of the population. In some centres, the ineffective system of employing nurses and midwives as health visitors is still in vogue. The provinces which employ the greatest number of health visitors are the Punjab, the Central Provinces and Delhi. The two former provinces have for some years had health schools which are financed by the provincial governments concerned. The presence of a training school and the number of welfare centres and health visitors employed are circumstances which are always closely connected. If a province is intent on work of this kind, it finds it necessary to provide a school for training workers. It is therefore no accident that the two provinces which have their own training schools should have the greatest number of health visitors. Nor is it accidental that the Presidencies of Bengal and Bombay, which have never supported the schools which voluntary societies have established, should be poorly supplied with health visitors. The Madras Presidency has a school which is supported mainly by the Indian Red Cross Society, but it is now receiving a Government grant. Burma is hoping to start a school of its own in the near future. The Lady Reading Health School at Delhi continues to be an All-India Institute and it is hoped that in the course of time it may undertake the training of a superior grade of workers as indicated in the report of the previous year.

Vaccination against smallpox.—Once more, because of the higher incidence of smallpox, vaccination operations in British India increased from 20,587,799 in 1932-33 to 22,143,370. The increase of 1,639,392 revaccinations was almost wholly due to the large increases under this head in the Madras Presidency (1,902,368) and in Burma (117,150). Of the 9,678,876 registered infants only 43 per cent were successfully protected. Nearly 97 per cent of the primary and 51 per cent of the revaccinations were recorded as successes.

MEDICAL RESEARCH

The Indian Research Fund Association, in spite of the continued 'cut' in its grants from the Government of India, has courageously proceeded with most of its larger and more important enquiries and has not hesitated to draw further from its invested capital in order to maintain the programme of research which its Scientific Advisory Board and Governing Body have considered essential. It has not, of course, been possible to find money sufficient to finance all the enquiries which might have received support in happier circumstances, but on the whole there has been less curtailment in research than in other medical and public health fields of activity and it is only fair to state that nothing of first importance has been eliminated. The Indian Research Fund Association has indeed sanctioned an expanded programme of research on cholera and, whilst the proposed cholera commission has not been instituted, the various enquiries connected with this disease and its causative organism have been co-ordinated by means of a cholera advisory committee whose function is to control a planned scheme of research without interfering with the personal initiative

and individuality of the different workers. Past experience, indeed, has shown that team work is essential if success is to be achieved in the investigation of a subject like cholera which possesses so many inherently different aspects and recent results have fully corroborated that experience. Important progress has already been made and there is every hope that considerable light will be thrown upon a number of the many problems associated with this disease. Further investigations on the cholera bacteriophage both in the field and in hospital have been included in the research programme in order, if possible, to reach definite conclusions as to the value of this 'entity' in the prevention and treatment of the disease. This branch of cholera research has now been in progress in India for over 6 years and, whatever the eventual verdict may be, no one can deny that every effort has been made to assess correctly the part which cholera bacteriophage may play in the control of this epidemic disease.

The Malaria Survey of India is still entirely financed by the Indian Research Fund Association and whilst the annual grants for the maintenance of that organization constitute a considerable percentage of the annual budgets of the association, the cost is minute in relation to the immensity of the malaria problems of this country and there can be no doubt that India obtains full value for the expenditure incurred. Whilst the malaria survey has not yet become an integral part of the Government of India's Public Health Organization, in actual practice it functions as such and the advice and services of its officers are always at the free disposal of central and local administrations in connection with malarial problems.

Nutritional research continues to occupy an important place in the programme sanctioned by the Indian Research Fund Association and at the laboratories at Coonoor, till recently under the direction of Major-General McCarrison, a whole series of important departments have been developed. As in other fields of research, additional lines of work have been gradually evolved and it is almost impossible to envisage what the future may have to give from these developments. Fortunately for India, the Governing Body of the Indian Research Fund Association has never failed to realize the importance of this branch of medical research and whilst there seems no immediate prospect of establishing an institute of nutrition such as already exists in many other countries, the basic requirements for progress have been satisfactorily provided in the Coonoor laboratories. A further desirable extension of the work has recently been sanctioned by the Indian Research Fund Association and plans are now being made for a comprehensive survey of the nutritive values of the common food-stuffs of the different provinces of India.

It is obviously impossible even to enumerate the different research enquiries now being carried out under the auspices of the Indian Research Fund Association and if a few of the more important have been given specific mention, that must not be taken to imply that the others are not of importance. For more detailed descriptions of these enquiries reference must be made to the report of the Scientific Advisory Board and to the *Indian Journal of Medical Research* and the *Records of the Malaria Survey*, the two journals published under the auspices of the association. In addition, a considerable amount of valuable research work is also being carried out by various departments of the medical colleges situated in different parts of India.

[This abstract, which has extended over three issues of the *Gazette*, is quite inadequate as a complete résumé of this valuable report, because complete sections have been entirely ignored. This is only because of want of space and not because they are not of importance and interest, and our only regret is we are unable to deal with the report at greater length. The six rupees four annas charged for this report would

be money well spent by any organization or individual in India interested in public health in any of its numerous branches.]

REPORT OF THE TECHNICAL COMMISSION* OF THE HEALTH COMMITTEE

INTRODUCTION

THE Commission is in agreement with the conclusions of the Burnet and Aykroyd Report that deficiencies in important nutrients are a common feature of modern diets and that these deficiencies usually occur in the protective foods (foods rich in minerals and vitamins) rather than in the energy-giving foods (proteins, fats and carbohydrates). The Commission has set out its findings in two parts: part I dealing with the requirements of energy-giving foods; part II with mineral and vitamin requirements.

PART I

Energy, protein and fat requirements

1. *Calorie requirements.*

(a) An adult, male or female, living an ordinary everyday life in a temperate climate and not engaged in manual work is taken as the basis on which the needs of other age-groups are reckoned. An allowance of 2,400 calories net per day is considered adequate to meet the requirements of such an individual.

(b) The following supplements for muscular activity should be added to the basic requirements in (a):

Light work:	up to	50	calories per hour of work.
Moderate work:	"	50-100	" "
Hard work:	"	100-200	" "
Very hard work:	"	200	" and upwards per hour of work.

* The personnel of the Commission was as follows:—

United Kingdom.

Professor E. P. Cathcart, Professor of Physiology, Glasgow University;
Professor E. Mellanby, Secretary-General of the Medical Research Council, Professor of Physiology at the Royal Institution, London;
Sir John Boyd Orr, Director of the Imperial Bureau of Animal Nutrition, Reid Library, Rowett Institute, Aberdeen.

United States of America.

Professor E. V. McCollum, Professor of Biochemistry, Johns Hopkins University, Baltimore;
Dr. Mary Swartz Rose, Columbia University, New York;
Dr. W. Sebrell, Chief of the Department of Nutrition, National Institute of Hygiene, Washington, D.C.

France.

M. J. Alquier, Secrétaire général de l'Institut scientifique d'hygiène alimentaire, Directeur de l'Institut national agronomique, Paris;
Professor L. Lapicque, Professor of Physiology at the University of Paris, Faculté des sciences, Sorbonne, Paris.

Scandinavian States.

Professor Axel Höjer, Generaldirektor, Medicinalstyrelsen, Stockholm;
Professor C. Schiøtz, Professor of Hygiene at the University of Oslo.

U. S. S. R.

Professor B. Sbarsky, Director of the Central Nutrition Institute, Moscow.

(c) The energy requirements for other ages and for mothers can be obtained from the following table of coefficients:

Age (years)	Coefficient	Calories
1-2	0.3	720
2-3	0.4	960
3-5	0.5	1,200
5-7	0.6	1,440
7-9	0.7	1,680
9-11	0.8	1,920
11-12	0.9	2,160
12 and upwards (male and female).	1.0	2,400
Women:		
Pregnant	1.0	2,400
Nursing	1.25	3,000

The requirements for babies under 1 year are difficult to specify except in terms of body-weight, but the following allowances are considered adequate:

Age (months)	Grammes per kilogramme of body-weight
0-3	100
3-6	90
6-12	80-90

The muscular activities characteristic of every healthy child and adolescent necessitate additions to the basic requirements shown in (c). It is suggested that the activities of children of both sexes from 7-11 years be considered as equivalent to light work, of boys from 11-15 years as moderate work and of girls from 11-15 upwards as light work.

Allowance must also be made for women engaged in household duties, whether pregnant or not; these have to be reckoned as equivalent to light work for eight hours daily.

2. Protein requirements.

In practice, the protein intake for all adults should not fall below 1 gramme of protein per kilogramme of body-weight. The protein should be derived from a variety of sources, and it is desirable that a part of the protein should be of animal origin.

During growth, pregnancy and lactation, some animal protein is essential, and in the growing period it should form a large proportion of the total protein.

The following allowances of total protein are recommended:

Age (years)	Calories per kilogramme of body-weight
1-3	3.5
3-5	3.0
5-15	2.5
15-17	2.0
17-21	1.5
21 and upwards	1.0
Women:	
Pregnant	2.0
Nursing	2.0

3. All the above figures on which the Commission has agreed are average values and it is essential that they should be interpreted in the light of this fact.

4. Fat requirements.

Fat must be a constituent of the normal diet, but the data at present available do not suffice to permit a precise statement of the quantity required.

5. The influence of climate on dietary requirements.

In cold climates, the energy-content of the diet should be increased.

PART II

Mineral and vitamin requirements

6. The Commission recognizes the fact that the deficiencies of modern diets are usually in the protective foods (foods rich in minerals and vitamins) rather than in more strictly energy-bearing foods (rich in

calories). Among the former are, first and most important, milk and milk products, eggs and glandular tissues; then green-leaf vegetables, fruit, fat, fish and meat (muscle). Among the energy-bearing foods of little or no protective power are sugar, milled cereals and certain fats.

Of energy-giving foods, unmilled cereals are not rich in protective nutrients and the more they are refined the less is their protective power. Many fats, especially when refined, possess little or no protective constituents. Refined sugar is of value only as a source of energy; it is entirely devoid of minerals and vitamins. The increasing habit of the large sugar consumption tends to lessen the amount of protective foods in the diet and is to be regarded with concern.

7. Requirements of pregnancy and lactation.

The Commission has attempted to define the quantitative needs of protective foods for perfect nutrition in terms of the requirements for the pregnant and nursing woman. She should be regarded as the member of the population needing the greatest 'protection' in order to ensure adequate physical endowment for the child at birth and optimum nutrition during infancy.

The greatest difficulty in arranging such a diet is to provide adequate calcium, phosphorus, iron and vitamins B₁, B₂, C and D.

8. Milk, whole or skimmed, is a rich source of calcium salts and phosphates and of vitamin B₂, also a good source of vitamin B₁; milk fat is an excellent source of vitamin A. Eggs contain vitamins A, B₁, B₂ and D and are rich in iron. The proteins of these foods are not only themselves of the highest nutritive value, but also improve the utilization of the protein contained in cereals and vegetables. Milk has an additional advantage in the abundance and availability of its calcium salts and phosphates; these enhance the effect of any vitamin D derived from other articles of diet or from sunshine. Milk, although itself poor in iron, renders more effective the iron contained in the diet.

9. Ordinary diets are usually inadequate in vitamin D and, except in sunny seasons and sunny countries, a small daily ration of cod-liver oil is to be recommended in the diet of the pregnant and nursing mother and in that of the growing child. Fish-liver oils are the richest known natural sources of vitamin A and are also important sources of iodine. In goitrous regions, where sea-fish are not available, the provision of extra iodine in the form of iodized salt or in some other way is recommended.

10. An extended dietary use of the potato is recommended to replace part of the sugar and highly milled cereals in the ordinary diet. Potatoes provide extra vitamin C and more readily available calcium and phosphorus than are present in cereals. Potatoes also yield more iron and B vitamins than milled cereals.

The above paragraph applies to countries where potatoes are abundant, but it is of general application, due account being taken of local resources.

11. Requirements of other adults and children.

Tables I, II, III and IV contain details of specimen diets derived from investigations made in Great Britain, the United States and Scandinavian countries, considered satisfactory for a pregnant or nursing woman and for infants and children of ages up to 5 years. They are put forward as models which could be modified in many particulars according to national dietary habits and supplies, provided that the dietary principles contained in them are duly regarded.

The protective foods in table I are arranged to yield approximately 1,400 calories without inclusion of cereals, fats or sugar; these can be added as required to satisfy the energy requirements of any individual. For adults other than the pregnant and nursing woman, the amount of protective foods might be reduced, if necessary, for economic reasons. For growing children, however, the maintenance of a high proportion of protective foods should be the aim.

In tables II, III and IV, specimen diets are drawn up on the above basis for age-groups 0-1, 1-2, 2-3 and 3-5 years. Since the rate of growth of a child decreases with advancing age, approximately the same amount of the protective foods will suffice for 10-15-year-old children as is required for the 5-year-old child.

12. General recommendations.

A. Although a simplified diet may be so constituted from a few protective foods as to be satisfactory, it is a general principle that variety in diet tends to safety, provided it contains a sufficiency of the protective types of food materials.

B. White flour in the process of milling is deprived of important nutritive elements. Its use should be decreased and partial substitution by lightly milled cereals and especially by potatoes is recommended. The consumption of an excessive amount of sugar is to be condemned, and in this case also partial replacement by potatoes is urged.

C. Milk should form a conspicuous element of the diet at all ages. The Commission commends the tendency manifested in some countries to increase the daily intake up to one litre per day for pregnant and nursing women, as well as to provide an abundant supply for infants, children of all ages and adolescents. The practice of providing milk either free or at a reduced price to these is highly recommended.

The Commission desires to draw attention to the high nutritive value of skimmed and separated milk, which, although deprived of its vitamin A through removal of the fat, retains the protein, the B and C vitamins, the calcium and other mineral elements. The Commission deplores the large wastage in many countries of this valuable food.

D. Fresh vegetables and/or fruit should always be constituents of the normal mixed diet. Adequate provision of the vitamins other than vitamin D can be readily accomplished by inclusion in the diet of optimum amounts of protective foods. Where these are not available, only such vitamin preparations as are officially controlled and approved should be permitted.

E. The Commission emphasizes the need for provision of extra vitamin D, either as cod-liver oil or as irradiated products, wherever and whenever sunshine is not abundant, especially in the period of growth and during pregnancy.

13. Problems recommended for further study.

A. Assessment of the nutritional state of children.
B. Nutritive food requirements during the first year of life.

C. Minimum vitamin and mineral requirements.

D. Minimum fat requirements.

E. The nutritive and 'supplementary' values of the different protein-containing foods, to determine to what extent and in what forms animal protein is necessary for growth and health.

F. The relative nutritive value of different cereals according to the degree of milling.

G. The extent to which the increasing consumption of sugar is detrimental to health.

H. Influence of climate on food requirements.

I. The extent to which diets in common use fall below the standards recommended in this report.

TABLE II

Infants

Age 0-1

Breast-feeding is strongly recommended during the first nine months of life. Where and when sunshine is not abundant, each breast-fed infant should receive a small daily ration of cod-liver oil, up to 6 grammes daily, to supply the antirachitic vitamin D. This is even more important for artificially-fed infants. Fresh fruit and/or vegetable juice to provide antiscorbutic vitamin C should also be given to every infant, especially the artificially-fed.

When breast-feeding is not possible, the basis of the infant's diet should be milk, suitably modified if

TABLE II—concl'd.

necessary, and supplemented by an adequate amount of substances rich in vitamins A, C and D.

Where complete breast-feeding is impracticable, partial breast-feeding is urged, and the supplementary diet should consist of cow's milk and other suitable protective foods.

Age 1-2 (1,000 calories)			
Food	Amount (grammes)	Calories	Protein (grammes)
A. Protective foods			
Milk	1,000	660	32
1 Egg (or equivalent, as 30 grammes meat or fish or liver, if available) ..	48	70	6
Green leafy vegetables	30-60	15	—
Potato (and other root vegetables) ..	50	50	1
Cod-liver oil ..	3	30	—
A source of vitamin C (raw vegetable or fruit)			
		825	39
B. Supplementary energy-yielding foods			
Fats (butter, if possible)	3.5	25	—
Cereals (as wheat) ..	50	150	7
TOTAL ..		1,000	46

TABLE III

Age 2-3 (1,200 to 1,300 calories)

Food	Amount (grammes)	Calories	Protein (grammes)
A. Protective foods			
Milk	1,000	660	32
1 Egg (or equivalent, as 30 grammes meat or fish or liver, if available) ..	48	70	6
Green leafy vegetables	60-100	20	2
Potato (and other root vegetables)	100	100	2
Cod-liver oil ..	3	30	—
A source of vitamin C (raw vegetable and fruit)			
		880	42
B. Supplementary energy-yielding foods			
Fats (butter, if possible)	3.5	25	—
Cereals (as bread)	100	300	14
TOTAL ..		1,205	56

TABLE IV

Age 3-5 (1,400 calories)

Food	Amount (grammes)	Calories	Protein (grammes)
A. Protective foods			
Milk	1,000	660	32
Egg	48	70	6
Meat, fish or liver	30	40	6
Green leafy vegetables	100	30	3
Potato	150	150	3
Cod-liver oil ..	3	30	—
A source of vitamin C (raw vegetable or fruit)			
		980	50
B. Supplementary energy-yielding foods			
Fats (butter, if possible)	7	55	—
Cereals (as bread) ..	125	400	17
TOTAL ..		1,435	67

ANNUAL REPORT OF THE INSTITUTE FOR MEDICAL RESEARCH, FEDERATED MALAY STATES, FOR THE YEAR 1934

During the year under review the institute has been handicapped by a further decrease in the funds available for expenditure. Year by year successive decreases in the grants have, of necessity, been imposed, until, to-day, the estimates for annually recurrent expenditure are below sixty per cent of the corresponding total for 1930. The staff has throughout co-operated most loyally in effecting all possible economies, but the policy of patching and repair cannot be continued indefinitely; no further reductions are possible under the present conditions, and some increase in expenditure will be necessary in future years. A serious feature has been the reduction in the allocation for the library.

Investigations have further confirmed the great similarity, if not the identity, of the viruses of 'rural' tropical typhus ('K' type) and of Japanese river fever. Experiments have also been undertaken, on the insect carriage of the local typhus-like fevers, that have demonstrated beyond doubt the capacity of the rat flea *X. cheopis* to function as a vector of 'urban' typhus ('W' type) from rat to rat, and hence, in every probability, from rat to man. On the other hand, *X. cheopis* failed to 'carry' the virus of 'rural' typhus and, moreover, experiments with *D. andersoni* (a vector of Rocky Mountain spotted fever) and with *R. san-guineus* were also attended by negative results.

Atebrin has received further attention: comparing in detail the efficacy of courses of this drug *vis-à-vis* that of short curative courses of quinine in estate lines practice. Under the experimental conditions little is to be gained clinically from the employment of the more expensive preparation while from the economic point of view of estate management the scales are definitely in favour of quinine. On one of the estates, where these experiments were carried out, *A. maculatus*, *A. umbrosus* and *A. separatus* were all found to be infected—the last species is now recorded as a local carrier for the first time.

The chemical division has examined the usual large number of routine specimens that year by year are submitted for report. Little time has been available for special problems, but the mineral constituents of the raw waters of local supplies by the spectrographic method and the depression of the freezing point of local milks by means of the Hortvet cryoscope have been investigated: the majority of the determinations have been made on samples taken under supervision from cows of various breeds and from buffaloes.

[This brief abstract is taken from the general remarks of the Director, but in the research section of the report the pages devoted to tropical typhus and malaria are of special interest and should be read in the original by those interested as they are fairly long and do not readily lend themselves to abstraction, but these two sections by no means exhaust all the research activities carried on at the institute, as investigations into organisms of the enteric group, typing of pneumococci, experiments with vaccine lymph, and testing of water supplies are also reported among other lines of inquiry being engaged in. There is also the immense amount of routine bacteriological, pathological and public health laboratory work recorded which indicates this laboratory is one of the busiest in the East.]

A REPORT OF THE SIXTY-FIRST YEAR'S WORK IN INDIA OF THE MISSION TO LEPERS

A Review of the Year's Medical Work

In looking over the statistics for the past few years, the most striking feature is the rapid increase in out-patients treated. Within the last two years the number has more than doubled itself, and now exceeds the total of the inpatients under treatment. This is a very important extension of the work of the mission.

On the other hand, the results from outpatient treatment are apparently not as satisfactory as those

obtained among the inmates; the disease being arrested in only 1.3 per cent of the former, as compared to 14.7 in the latter. While outpatient treatment is useful, the impossibility of regular attendance and the difficulty of backing up drug treatment with the far more important dietary and hygienic measures, detracts considerably from its value.

Many of those who attend the outpatient clinics are would-be inpatients, for whom accommodation is not available. The workers of the mission are everywhere faced with the sad problem of turning away many who need and beg for help, but for whom there is no room.

It is estimated that there are, about one million people suffering from leprosy in India, of whom probably at least 200,000 are highly infectious, and are spreading the infection to the next generation. How can the mission break this vicious circle, with its accommodation for only six or seven thousand?

Perhaps the answer may come to a certain extent through the 842 'arrested without deformity' during the last year. This is the brightest feature in the statistics—842, an ever-increasing number compared with 570 in 1932 and 710 in 1933. If these could be trained in the technique of isolation, and act as missionaries when they return to their village, they might teach their fellow-villagers the danger of the infectious leper to the community, especially to the children.

Leprosy is so easy to prevent—so difficult to cure, and prevention can only be carried out in India when the villager recognizes the danger and understands the simple measures necessary for carrying it out.

LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE (UNIVERSITY OF LONDON) INCORPORATING THE ROSS INSTITUTE. REPORT ON THE WORK OF THE SCHOOL FOR THE YEAR ENDED 31ST JULY, 1935

This report includes an account of the operations of the Ross Institute of Tropical Hygiene during the first complete year since its incorporation in the School.

Close relations have been maintained with the Ministry of Health and the Medical Research Council and we are grateful to both these bodies for assistance in carrying out much of our research work.

Full advantage has been taken during the past year of the policy of the board of management to encourage members of the staff to pay visits to tropical and sub-tropical countries for the purpose of conducting special investigations or studying local problems.

Division of clinical tropical medicine.—As stated in last year's report, Sir John Megaw was appointed to lecture on leprosy, dengue, sandfly fever and typhus fevers, and Colonel F. P. Mackie on cholera and plague. These lectures have been given this year and the students have appreciated them very much.

The subjects under special investigation during this period have included: (1) sprue; (2) malarial anaemia in man and experimental haemoglobinuria in monkeys; (3) blackwater fever; (4) the immunological reactions in helminthic diseases. The lines followed have already been indicated in previous reports.

Department of helminthology.—A notable gift has been made to the department by the council of the Royal College of Surgeons. The collection of miscellaneous specimens and microscopical preparations which had been handed to the College by the late Professor Cobbold's executors and had been stored in the Hunterian Museum for many years has been transferred to the department of helminthology. Among the specimens were found a number of early preparations made by Sir Patrick Manson in China and these have been placed in the school museum.

Department of entomology.—It has recently been shown that the parasite of bird malaria has a harmful effect upon the mosquito vector. It appears desirable that similar studies should be made on several species of *Anopheles* with one of the human malaria parasites. Dr. Wigglesworth's published work has shown that

metamorphosis is controlled by a hormone: he suggests that the phenomenon of diapause may have a similar explanation. This is of considerable interest, because diapause has puzzled entomologists for many years: owing to these interruptions of development, fluctuations in the numbers of insects of economic importance are much more complex and much more difficult to control than they would otherwise be.

Department of protozoology.—The amount of time allocated for the teaching of hæmatology and protozoology is extremely limited and in consequence it has been found necessary to restrict the scope of instruction to such investigations as are essential to clinicians in the diagnosis of disease. The close co-operation with the school of the hospital staffs at Gordon Street and Albert Dock Hospitals has been invaluable in that a supply of fresh material has been made available for practical laboratory studies. The various pathogenic parasites of man, the trypanosomes, leishmanias, spirochaetes, amœbæ and flagellates are all kept in culture and thus the students are able to study these in the living state. Further, Sir Rickard Christophers has very kindly demonstrated the malarial parasites in freshly dissected mosquitoes and the students have had ample opportunity of seeing the technique of examining infected mosquitoes for oöcysts and sporozoites. Colonel James of the Ministry of Health and Mr. Shute have supplied numerous fresh films of the various parasites of malaria and the department is much indebted to them. Old students of the school have, during the past year, provided an abundance of material for laboratory work, and in this connection special thanks are due to the medical men in Assam and in India who are working in collaboration with the Ross Institute.

Dr. B. M. Das Gupta from the Calcutta School of Tropical Medicine has been working in the department from the beginning of June while holding a Rockefeller travelling scholarship.

Division of bacteriology.—The teaching work of the division has not differed from that of previous years. Professor Wilson's investigation into the bacteriological grading of milk is now completed. Professor Wilson has completed his report, and this has been accepted by the Medical Research Council for publication in their special report series. The main conclusions are that neither of the present methods, i.e., the plate count or the coliform count, is suitable as a routine test for the grading of milk. On the other hand, a modified methylene-blue reduction test has been devised, which is simple, inexpensive, and accompanied by only a small experimental error. It is hoped that this test will be used widely in the control of milk supplies in the country.

Miss Wills, working with a Lady Tata Memorial Scholarship, and assisted by Mrs. Stewart, has continued her study of macrocytic anæmia. The response of the *rhesus* monkey to various anæmia-producing stimuli showed that these animals were suitable subjects for experiment. By feeding them with a deficient diet, a macrocytic anæmia similar to tropical macrocytic anæmia of man was produced. Animals thus rendered anæmic were used for an investigation, in collaboration with the biochemical department, of the nature of the hæmopoietic factor present in marmite with particular reference to the newly-described vitamin B₁₂ fractions.

Division of biochemistry and chemistry.—The main work of the division is of a research nature and has been continued on two main lines, (a) on the biochemistry of the lower fungi, and (b) in collaborative work with certain members of the staff of the division of bacteriology and immunology on problems connected with immunological chemistry.

Division of public health.—Much of the work of the Dean's office falls inevitably upon the staff of the division and a great deal of time is spent on meeting the requirements of students and of scientific visitors from overseas who make this school their headquarters during their stay in this country.

Mr. Clay left for India towards the end of the summer term where, in company with Dr. Ramsay of the Ross Institute, he paid a large number of visits to factories and estates in order to study and, where necessary, to advise on systems of sanitation.

Ross Institute of Tropical Hygiene.—The activities of the Ross Institute of Tropical Hygiene may be classed generally as:—

1. Work overseas consisting of:—
 - (a) Practical assistance to governments and industrial undertakings;
 - (b) Scientific research in association with this practical work.
2. Work in London consisting of:—
 - (a) Assistance and advice chiefly to commercial companies; and
 - (b) The teaching of tropical hygiene to both medical men and laymen who have been or who are going abroad.

Malaria research unit.—The malaria research unit under the direction of Professor Sir Rickard Christophers has continued to function as a centre for experimental work on malaria and to carry out researches and other activities in connection with this important disease.

The main research during the year has continued to be that directed to determining the biochemical principles underlying the action of antimalarial drugs. As the absorption of quinine by such material as isolated parasite substance and red cells has been found to be that characteristic of a base absorbed by protein, the absorption of acid and base under such circumstances has been studied in some detail. The results obtained have justified the time spent as they have indicated very definitely the mechanisms and equilibria involved so that it will be possible as a result to investigate absorption of quinine and other drugs from a more informed point of view. The results of this work which are on the point of publication indicate that absorption under such circumstances is to be regarded as combination between the protein of the organism or cell and the acidic or basic element forming what are virtually 'protein salts', there being always a fraction unabsorbed represented by the 'hydrolysis' of these salts under the particular conditions of the experiments. Where the acid or base is very weak as is the case with chemotherapeutic substances the fraction unabsorbed becomes very great. The significance of these observations lies in the fact that quinine and all other known antimalarial drugs have a basic side chain the importance of which can scarcely be accidental. The absorption of the substances, it is thought, must be governed in the first place by this fact, thus bringing quantitative considerations into play similar to those found in the absorption of acid and base by protein.

Tropical mycology.—Further researches have been made during the past year on the biological reactions in a large number of fungi and bacteria in media containing various carbohydrates and allied substances. A new reaction which may be used in the future classification of organisms has been investigated.

Institute of Agricultural Parasitology.—The researches carried out by the staff of the Institute at Winches Farm have, as in former years, been concerned with the helminth diseases of (a) farm stock, (b) poultry and game, (c) economic plants and (d) insect pests.

THIRTY-SIXTH ANNUAL REPORT OF THE INCORPORATED LIVERPOOL SCHOOL OF TROPICAL MEDICINE, 1934-35

Department of tropical medicine.—The professor and his colleagues have continued their researches in chemotherapy during the year and have devoted their attention particularly towards investigating the fate of different types of arsenical compounds after introduction into the animal body.

They have also continued to examine the therapeutic action of new compounds submitted to them by the

Chemotherapy Committee of the Medical Research Council.

Department of tropical hygiene.—The autumn term of 1934 was devoted to organizing the new department, there being no course of instruction for the Diploma in Tropical Hygiene during this period.

During the Lent Term, 1935, in addition to the usual course of instruction for holders of the Diploma in Tropical Medicine, a special short course in tropical hygiene was also held for non-medical persons proceeding to posts of various kinds in the tropics.

The School and University have granted leave of absence to Professor Blacklock to go to the East for a period extending from 13th July to the end of the year in order to make a comparative study of the methods of applied hygiene, especially rural hygiene, which have proved most useful. His itinerary includes visits to China, Netherlands East Indies, Malaya, India and Ceylon.

Department of entomology.—Professor Patton has continued his comparative studies of the male and female terminalia of the higher flies. The results of these studies have been most encouraging, as they are already throwing new light on the true relationships of the main divisions to each other, and, incidentally, go a long way to simplifying the classification of these flies. A series of papers dealing with these characters in several subfamilies, some of which include species of medical and veterinary importance, have been published. In connection with this work, a large amount of material from many parts of the world has been identified.

Department of parasitology.—During the year, extensive rearrangement and classification of the helminthological and protozoological material was

carried out; numerous specimens were identified and added to the departmental collections.

Research into the life-history of certain important parasites of domestic stock has been carried out at Knowsley as opportunity allowed. A considerable amount of important information has been collected.

SIR ALFRED LEWIS JONES LABORATORY, FREETOWN

The work on schistosomiasis, which had occupied much of the time available for research during the past two and a half years, was finally published in October 1934.

In December 1934, a serious outbreak of yellow fever occurred in the Gambia, and at the request of the Colonial Office Dr. T. H. Davey, from the staff of the laboratory, accompanied by Dr. Findlay (of the Wellcome Research Bureau), spent two months in the Gambia immunizing the susceptible population and carrying out various investigations.

In view of the outbreak of yellow fever in the Gambia and the occurrence of a single European case in Sierra Leone, the Director of Medical and Sanitary Services asked the laboratory to help his department by preparing a pamphlet on the subject of yellow fever and its prophylaxis.

Museum.—Work in the museum during the year consisted chiefly in adding further panels illustrative of various tropical diseases. The majority of such gifts have now been dealt with in a fairly adequate manner.

The preventive aspect of tropical medicine has not as yet been adequately shown, owing chiefly to shortage of illustrative material; it is hoped that the Curator during her tour in the East will be able to obtain photographs and specimens which will aid in the making up of this deficiency.

Correspondence

THE TREATMENT OF LOBAR PNEUMONIA WITH INTRAVENOUS INJECTIONS OF ALCOHOL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I was interested in the article which appeared in your paper for December 1935. In this connection I would like to point out a few contra-indications which were mentioned in *Le Journal de Medecine de Lucas-Championniere*, which gives the following abstracts on the thesis of M. Michel Hetroy on indications and contra-indications for intravenous alcohol, viz:

'INDICATIONS FOR INTRAVENOUS ALCOHOL

(1) *Acute and chronic lung diseases.*—True acute pneumonia (indication for alcoholic treatment is rare in view of the usual favourable course of the disease); pneumonia of old people or as a result of injuries ending in sepsis (prognosis often hopeless); lung abscess (useful as an adjunct, but its use does not exclude surgical interference which remains the only effective treatment); influenzal broncho-pneumonias (good effect); following shock and post-operative pulmonary complications (brilliant and rapid results).

(2) *Septicæmias.*—Puerperal and all other types of septicæmias.

(3) *Acute barbituric intoxications.*—It will be seen from the above that the indications for intravenous alcohol are varied and, as Hetroy has remarked, they can be further extended. It is evident that they can be employed with success in all cases where alcohol by mouth is indicated and where its oral use is contra-indicated (operations on the stomach). For example, it may be used in debilitating types of influenza and

fractures of the thigh, in old people to combat hypostatic congestion (the author has had several cases of this type), in all infections where pulmonary complications are feared, in cardiac cases with chronic venous congestion and, finally, in all cases where infection is present or imminent.

Contra-indications.—The chief one is when the method is withheld too late. In advanced liver, kidney or heart diseases, alcohol should be used cautiously and in small doses. The same applies to hæmoptyses, although, according to the author, these are not contra-indications. It has been said also that intravenous alcohol should not be used in infants, but if small doses such as 0.5 c.cm. per kilo are given intramuscularly, no danger is to be anticipated'.—Yours, etc.,

JOHN S. BRADFORD, M.D.,
Group Medical Officer.

BINNAGURI P. O.,
DOOARS.

Service Notes

APPOINTMENTS AND TRANSFERS

MAJOR-GENERAL A. W. F. HARVEY, K.H.S., is appointed to be Deputy Director of Medical Service, Northern Command, *vice* Major-General T. G. F. Paterson, C.B., D.S.O., K.H.P., retired. Dated 24th November, 1935.

Colonel E. W. C. Bradfield, C.I.E., O.B.E., V.H.S., is appointed Honorary Physician to the King, 14th August, 1935, *vice* Major-General H. R. Nutt, retired.

Lieutenant-Colonel A. A. C. McNeill is appointed Honorary Physician to the King, and is promoted Brevet-Colonel 6th August, 1935, *vice* Colonel H. E. Stanger Leathes, retired.

Lieutenant-Colonel G. G. Jolly, C.I.E., V.H.S., Deputy Director-General, Indian Medical Service, is appointed to officiate as Public Health Commissioner with the Government of India, in addition to his own duties, from the 8th September, 1935, till the 26th November, 1935, and as whole-time Public Health Commissioner with effect from the 27th November, 1935 (forenoon), *vice* Brevet-Colonel A. J. H. Russell, C.B.E., K.H.S., granted leave.

Lieutenant-Colonel Dewan Hakumat Rai, M.C., is appointed to officiate as Deputy Director-General, Indian Medical Service, with effect from the 27th November, 1935 (forenoon), *vice* Lieutenant-Colonel G. G. Jolly, C.I.E., V.H.S., appointed to officiate as Public Health Commissioner with the Government of India.

Major G. Verghese, Superintendent, Bihar and Orissa Jail Department, is confirmed in that appointment.

The services of Captain A. N. Chopra are placed temporarily at the disposal of the Government of Bombay, with effect from the afternoon of the 8th November, 1935.

Captain C. K. Lakshmanan is appointed temporarily as a supernumerary officer in the Port Health Department, Bombay, with effect from the forenoon of the 16th December, 1935.

Captain B. S. Sandhu made over charge of the Presidency Jail to Lieutenant-Colonel M. A. Singh, on the forenoon of the 6th January, 1936.

The services of Captain B. S. Sandhu, formerly Superintendent, Presidency Jail, are replaced at the disposal of the Government of India on the expiry of the leave granted to him.

The services of Major J. R. Katariya, formerly Superintendent, Presidency Jail, are replaced at the disposal of the Government of India, Army Department, for military duty, with effect from the 16th September, 1935.

This cancels previous notifications.

Captain B. N. Hajra did general duty at the Medical College Hospitals, Calcutta, for the period from the 25th December, 1935, to the 1st January, 1936. He is appointed as Civil Surgeon of Bakarganj, *vice* Dr. Charu Chandra Sinha.

Captain C. K. Lakshmanan is appointed provisionally as Port Health Officer, Calcutta, with effect from the 10th February, 1936, until further orders.

To be Captains (on probation)

1st November, 1935

Abraham Henry Barzilay, with seniority as Lieutenant 1st November, 1930, and as Captain 1st November, 1933.

Robert Keith Muir, C.M., with seniority as Lieutenant 6th August, 1931, and as Captain 1st May, 1934.

Patrick Michael McSwiney, with seniority as Lieutenant 5th September, 1932, and as Captain 1st May, 1934.

To be Lieutenants (on probation)

1st November, 1935

John Andrew Lawson McCullough, with seniority 1st November, 1934.

Daniel John Percy Parker, with seniority 1st November, 1934.

Clifford Llweellyn Ash, with seniority 1st November, 1934.

Thomas Cecil McGarrie McDougall Morrison, with seniority 1st November, 1934.

Victor Douglas Gordon.

Brian de Burca.

Donald Ross Nicol.

Joseph Morgan.

Thomas Sommerville.

Lieutenant C. K. Byrnes and Lieutenant G. F. Adye Curran are reinstated to the establishment, 1st November, 1935.

PROMOTIONS

Majors to be Lieutenant-Colonels

C. M. Nicol. Dated 14th November, 1935.

D. R. Thomas, O.B.E. Dated 30th November, 1935.

P. Verdon. Dated 1st December, 1935.

D. V. O'Malley, O.B.E. Dated 8th December, 1935.

S. A. Phatak. Dated the 23rd December, 1935.

Lieutenants (on probation) to be Captains (on probation)

J. Duffy. Dated 15th October, 1935, with seniority 23rd April, 1933.

K. Cunningham. Dated 15th October, 1935, with seniority 23rd April, 1933.

I. J. Franklen-Evans. Dated 15th October, 1935, with seniority 23rd April, 1933.

LEAVE

Lieutenant-Colonel C. H. Smith, O.B.E., an Agency Surgeon, is granted leave on average pay for 8 months combined with leave on half average pay for 1 year and 8 months, with effect from the forenoon of the 21st November, 1935, pending retirement.

Major H. H. Elliot, M.B.E., an Agency Surgeon, is granted leave on average pay for 3 months combined with study leave for 3 months and leave on half average pay for 3 months, with effect from the afternoon of the 15th October, 1935.

In supersession of previous notification, Captain A. M. Sheridan, Civil Surgeon, Coorg, was granted leave on average pay for 6 months combined with study leave for 6 months, with effect from the 4th September, 1935.

Captain B. S. Sandhu, lately Superintendent, Presidency Jail, is allowed leave on average pay for 2 months, with effect from the 6th January, 1936.

RETIREMENTS

Major-General T. G. F. Paterson, C.B., D.S.O., K.H.P., retires. Dated 24th November, 1935.

Colonel E. C. Hodgson, D.S.O., K.H.P., retires. Dated 22nd October, 1935.

Lieutenant-Colonel B. Higham, C.I.E. Dated 14th December, 1935.

Notes

ULTRA-VIOLET RADIATION

THE value of ultra-violet radiation is appreciated far less in this country than in many countries in the West. This is partly because anything that is abundant is never valued at its full worth—and ultra-violet rays are abundant in India for most of the year. Despite the fact that a large percentage of the population live on a diet inadequate in most vitamins, the diseases caused by vitamin-D deficiency are comparatively rare except in the towns where the smoky atmosphere prevents these rays reaching the earth, and those who live on it.

The sun's rays, valuable as they are in therapeutics, have their limitations—they contain rays other than ultra-violet rays that may be harmful in any particular case, the dosage—especially in towns—is difficult to estimate and therefore difficult to control, and the sun's rays are difficult to localize. For these reasons artificial ultra-violet radiation is often to be preferred.

The Hanovia Company, one of the largest manufacturers of equipment for light therapy, have issued a very interesting little booklet entitled *The Most Vitalizing of all Measures*. In this they quote one hundred clinical references to the use of actinotherapy in general practice. The following extracts which may prove of interest to our readers are given:—

'The resistance of some patients may be so depressed that they are unable to eradicate the trouble in spite of

surgical help; in these cases the greatest attention must be paid to diet and care of the bowels, iron and vitamin therapy are necessary, and the most vitalizing of all measures, general ultra-violet light therapy, is given daily'.

'Light is of universal necessity to the life and well-being of cell development and sustenance. Without light, proper metabolism is impossible, and when scientifically applied to suitably selected cases, it will do infinitely more than any other agent in the service of man to restore normal physiological conditions'.

Anæmia.—The majority of the cases treated were either children who were anæmic, particularly the type following upon the occurrence of an infectious disease or other debilitating illness, or children suffering from debility, a vague term signifying rather a tendency to disease than any actual disease, but characterized by such symptoms as fitful appetite, poor sleep, nervousness or malnutrition. After a course of ray treatment such a case usually goes on improving without further treatment'.

Acidosis and gastric ulcers.—'Ultra-violet light often relieves hyperacidity in certain miscellaneous disorders involving the secretory function of the stomach, and it is probable that the mechanism involved in this reaction plays an important part in effecting symptomatic relief in gastric ulcer. Certain it is that the pain of a gastric ulcer will sometimes clear up as quickly and as effectually as when a hypodermic injection of morphine has been given. Of course, there are other factors at work besides the lowering of the acid content. With the erythema produced, there is an increase in the elimination of toxins, and even their production is lessened by the destruction of the bacteria producing them'.

Colitis.—'From an intimate study of almost 3,000 cases of all types of colitis, I am convinced that a large number are associated with, if not due to, endocrine disturbances. The basic treatment is ultra-violet radiation, and to this is added infra-red radiation. When colitis is due to vitamin deficiency good results may be expected. Another established fact is that in some way or other ultra-violet radiation activates the deficient endocrine glands and thus tends to stabilize the endocrine system in which co-ordination has been disturbed. To one who has used ultra-violet extensively, examples are countless of increased weight, the disappearance of weakness, the building up of resistance against infection, relief of insomnia, improvement of appetite, most of which is without doubt due to its action on some part of the endocrine system and hence applicable to all forms of colitis of neurogenic origin and extremely useful in that almost hopeless of all colitides—the tuberculous type. The abdominal surface is first exposed for one half-hour to the infra-red lamp. This is followed by increasing dosage front and back with ultra-violet radiation, using the mercury vapour lamp'.

Eczema.—'Those of us who specialize in light therapy.....treat many cases of chronic eczema of all types which have defied the efforts not only of the general practitioner, but also of the skin specialist. I have just completed, with success, the treatment of a patient who had suffered from chronic eczema intermittently for thirty years'.

'The most dramatic cures were obtained in cases of eczema. In some cases chronic and unyielding to other forms of treatment for years, they yielded under treatment by artificial sunlight'.

Psoriasis.—'In spite of the cynic who stated that any new method will cure psoriasis—at first, there is no doubt that the mercury vapour lamp has proved itself a most astonishing success. Long-standing cases require more treatments than those of recent origin, but I have yet to meet with a case that is not greatly benefited by the treatment'.

'Psoriasis varies so greatly in type and distribution that it is obvious that the technique cannot be standardized. Provided the technique is adapted to each patient, many of the cases hitherto regarded as

'failures will respond well to treatment with ultra-violet radiation'.

Lumbago and sciatica.—Quick and lasting relief of a lumbago attack is obtained from regional doses of ultra-violet rays. Dr. J. Lepsky of the Soviet Medical Service says of 1,152 cases:—'The sum total of results obtained by means of local erythema doses justifies us in concluding that irradiation can be considered as a method of choice. Apart from its excellent therapeutic effects, this method possesses still further advantages:—the rapidity of the therapeutic results, the cheapness of this treatment; the decided shortening of the working incapacity period'.

Other forms of nervous pain likewise benefit greatly from ultra-violet radiation, suited to the case; migraine, *tic dolozeux*, and periodic headaches are quoted by Dr. F. Humphris. Dr. F. Talbot uses general light baths to clear up chronic neuralgia after dental surgery.

Pulmonary.—The commentary of Dr. Bach, the physician who introduced general irradiation with the quartz lamp, still holds good:—'It is primarily the organism itself which possesses powers by which healing is effected, and like all other remedies, natural and artificial light baths can only serve to stimulate and assist these natural powers. Where they are capable of improvement, success will be obtained by natural and artificial light baths and climatic cures in the treatment of all forms of tuberculosis superior to those yet achieved by any other method'.

The booklet, which is well worth reading, is available on request from Malgham Brothers, 26, Old Custom House Road, Fort, Bombay.

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SCIENTIFIC Articles and Notes of interest to the profession in India are solicited. Contributors of Original Articles are entitled to receive 25 reprints *gratis*; additional reprints can be obtained on payment. No reprints will be supplied unless contributors *ask for them at the time of submitting their manuscripts*.

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Original Articles

'MAN-MADE' MALARIA IN INDIA*

By J. A. SINTON, M.D., D.Sc.

LIEUTENANT-COLONEL, I.M.S.

(Director, Malaria Survey of India, Kasauli)
(Indian Research Fund Association)

IN touring through India, the public-health worker and the malariologist cannot fail to be forcibly impressed by the numerous occasions upon which the prevalence of malaria has been determined, or markedly increased, by the activities of man in areas where this disease was previously mild or even unknown.

The inhabitants of India do not appear to be content with the large amount of malarial sickness with which Nature has provided them, but, in many instances, they would seem almost to have made special efforts to increase the disease. Many of such harmful conditions are due to ignorance, but, in other instances, a deliberate neglect of those sanitary and other precautions, which have been emphasized on so many occasions, has been largely responsible. This applies not only to private individuals and communities, but also to industrial concerns and even to Government departments.

Many of these errors, both of omission and commission, react not only upon the health of the people in the areas concerned, but may affect seriously the economic prosperity and the financial status of the population, and, apart from a loss of revenue to the Governments, administrations and departments concerned, may also require a large expenditure of money to remedy them at a later date.

The effects of human activities in increasing the prevalence of malaria may be divided roughly, for the purposes of discussion, into the following headings:—

(A) Measures resulting in an increase of the malaria-carrying mosquito (*Anopheles*);

(B) The introduction of human malaria carriers; and

(C) Conditions leading to economic stress and a lowered resistance of the population.

These factors are usually seen in combination, and together may produce, and have produced, not only a high morbidity and mortality, but have led in India to industrial and agricultural decay, to economic stress, to the abandonment or inhibition of potentially promising enterprises, and to the depopulation, or the retarded development, of important and potentially rich tracts of country.

* This is the note, slightly amplified, which was circulated to the members of the Malaria Advisory Committee of the 13th All-India Conference of Medical Research Workers at their meeting in Calcutta on 3rd December, 1935.

(A) Measures resulting in an increase of malaria-carrying mosquitoes

Man by his activities has done very much to increase the breeding, multiplication and spread of the dangerous mosquitoes of India. Some of these activities have only produced comparatively local effects, while others have been of a more widespread nature, and so have given rise to more disastrous results.

(a) Local activities

(1) *Domestic*.—Increased facilities for breeding mosquitoes have been provided by:—absence of drainage, or badly constructed, badly planned or badly kept drainage; leaking water taps; water-storage receptacles, cisterns, etc. (Bombay); wells (Bombay, Delhi, Lucknow, etc.); ornamental tanks, fountains, mill-ponds, etc. (Delhi, Bombay, etc.); soak-pits; garden sumps; disused receptacles, tins, etc.; borrow-pits, etc., etc.

General remedies.—Local anti-mosquito measures; education of the public to the dangers of these conditions; appropriate legislation, with penalties (which should be enforced) to ensure the abolition, and prevent the future formation, of such harmful conditions.

(2) *Communal*.—In addition to the conditions already mentioned, communities as a whole may provide increased facilities for breeding dangerous and troublesome mosquitoes through:—absence of proper drainage systems, or the presence of badly planned, badly constructed, or badly controlled ones; improper siting of towns, villages, or buildings; building operations giving rise to borrow-pits, quarries, brick-fields, tanks to soak concrete, etc. (Bombay, Delhi, etc., etc.); badly kept and leaking irrigation channels (Punjab, etc.); over-irrigation (Delhi, etc.); construction of docks, harbours, water-works, etc., without proper sanitary precautions; badly planned and badly controlled water supplies; indiscriminate opening up of jungle in certain areas, etc., etc.

General remedies.—Education of communities and their representatives as to the dangers; legislation to enforce remedial measures and to prevent further transgression; anti-mosquito measures.

(b) Widespread activities

This aspect of the subject is usually connected with engineering works of greater or less extent. While many of the large engineering works in India, such as those connected with the improvement or extension of agriculture and communications, have added to the prosperity of the people in certain areas, in others they have led eventually to a diametrically opposite result. Not only has the economic status of the people been damaged but also their health.

As malarial incidence is intimately bound up with certain species of *Anopheline* mosquito, and as the latter insect can only develop in water, the conditions

in which the latter occurs in any locality are of paramount importance. As pointed out by Bentley and by Stewart, the potentialities of exposed collections of water for breeding large numbers of these insects are very often closely connected with the amount of water edge occurring in relation to the volume of water present. Thus when there is no exposed water edge (*i.e.*, when all exposed water is abolished) there can be no breeding, and, at the other extreme, when the sheet of water becomes so large that the edge in proportion to the exposed surface is infinitesimal, extensive breeding is also inhibited. It is under conditions between these two extremes that the factors are most favourable for the multiplication of such dangerous insects. It is evident, therefore, that, while a decrease of water (drainage, etc., in the Punjab) may be of value in some circumstances, in others this occurrence, due either to artificial (Bengal) or natural (Ceylon, Central Provinces) causes, may be productive of very serious results.

(1) *Increase in breeding places due to increase of water*

(i) Local excavations, etc., by causing exposure of the water table, or by acting as reservoirs of water, either from natural or artificial sources, very frequently give rise to an increased breeding of mosquitoes. Examples of these are borrow-pits (roads, railways, canals, building operations, etc.); brick-fields; wells; badly constructed or badly aligned or badly designed drains, canals, escapes, etc.; poorly graded culverts; disused portions of old canals, or drains; and also many of the conditions mentioned in the previous sections.

(ii) Obstruction to natural drainage often leads to much increase in exposed water. Examples of these are—roads, railways, canals and other embankments cutting across natural drainage channels and without allowance for sufficient waterway (*i.e.*, too few culverts, bridges, etc.) to permit a proper and sufficient run-off of water (universally seen) (*vide* Raja Ram, 1935); hindrance of natural drainage by dams and other obstructions to streams and rivers, resulting in a rise of the subsoil water level in the area above them (Delhi, Sukkur, Ferozepore, etc.).

(iii) An increased influx of water into an area, without the provision of proper drainage, causes increased breeding of mosquitoes. Examples of these are—rice and other wet cultivation (Saharanpore, Mopad, etc.); excessive use of irrigation water in areas where the subsoil water level is already high or likely to be in future (*vide infra* water-logging); ill-kept and leaking irrigation channels; seepages from canals, reservoirs, etc.; badly aligned canals, etc.

(iv) The introduction of large irrigation projects, without the provision of a proper drainage system at the same time, has been productive of much damage mainly through water-logging of the soil. Just as the human system is liable to become oedematous, if there be an obstruction to the veins in carrying away the fluid brought by the arteries, so, in an irrigation system, water-logging occurs if there be not

proper facilities for carrying off the excess water brought into a locality. That this not only results in an increase of malaria, but also in a serious decline in the agricultural prosperity of the area, has been known for many years.

The relationship between water-logging, malaria and agricultural decline was pointed out in India by Baker, Dempster and Yule (1847), about 90 years ago, in connection with the old Western Jumna Canal, and was later emphasized by Taylor (1870). Marchiafava and Bignami (Stedman, 1900), in speaking of the history of irrigation in California, say that this 'has made it plain that if irrigation works are not to become producers of malaria, drainage must proceed *pari passu* with irrigation; when this is not done, the water which brings riches brings also malaria'. Watson (1921) points out that 'Cromer insists that in Egypt, the success of irrigation depends no less on the channels for taking off the water than on the irrigation channels for its supply. It is notorious, too, that badly drained irrigated land is not only of less value agriculturally, but is also more malarious than irrigated land, where by means of an efferent system, the water on the land is more fully under control'.

Several workers have commented upon the harmful effects of water-logging in the Punjab. Christophers (1924) states that 'in the great Canal colonies, a serious menace is the malaria which is normally induced as the result of irrigation. At first relatively healthy, such areas are liable to an increasing malarial endemicity that, if it does not altogether nullify the good such schemes bring, at least detracts largely from this'. Gill (1930), in discussing the relationship of canal irrigation to malaria, states that 'it is certain that wherever canal irrigation gives rise to water-logging a vicious cycle is set up in which endemic malaria leads to bad health, bad health to economic stress and economic stress to further privation and sickness, and, finally, as the combined result of a high death rate, a low birth rate and emigration, to depopulation of the affected tract'.

King *et al.* (1929) have drawn attention to the serious results caused by water-logging following upon irrigation schemes in the Madras Presidency. The harm which may be done by such works has been emphasized by Rao (1929) who says—'It cannot, however, be too emphatically stated that the need for such irrigation works by no means implies the need to keep them in such an utter state of neglect as to be a constant source of danger to the general well-being. Even as the malaria investigator has got to view with sympathy the requirements of the agriculturist and the labours of the Revenue and the Public Works authorities on his behalf, the latter has equally to realize how necessary it is to ensure that the very facilities that are intended to give the ryot his daily bread do not act as his "death trap" as well. And it cannot be sufficiently brought home that a close collaboration between the two authorities would alone conduce to the optimum well-being of the people'.

From these authoritative statements, it is clear that the initial installation of a proper system of drainage in connection with all irrigation projects is essential, if the health of both the population and the land is to be preserved.

The need for such measures has been emphasized for many years. In certain provinces the vital necessity of such precautions has been realized, and the Water-logging Board of the Punjab (1930) have issued a statement of the 'principles to be observed in the preparation of canal projects and their execution'. Unfortunately, in connection with certain other large irrigation schemes initiated in recent years, the

results of the experience gained in the past, and repeated warnings, have passed apparently unheeded, with the result that the harmful effects of such ill-planned irrigation projects are already being felt, not only on the health of the people but on the agricultural value of the land (Sind). The conditions produced by a neglect of this principle are causing in India the loss of thousands of lives and crores of rupees annually, apart from the suffering of the population, the economic stress caused and the impoverishment of large tracts of valuable agricultural land.

Large sums of money are being spent in many parts of India in attempts to remedy the effects of a neglect of these principles, and these measures are almost certainly costing a much greater expenditure of money than would have been needed initially to prevent the occurrence of the damage. To this expenditure must be added also the losses due to the decreased revenue to the Government, the decreased prosperity of the population, the decreased fertility of the land and the decreased health of the people, which have already been caused by the neglect of proper precautions.

General remedies.—A proper consideration by an expert committee of the immediate and future results of such projects upon all aspects of the health and prosperity of the community, before schemes for any large engineering works are sanctioned. The committee should consist of expert representatives of the engineering, agricultural, financial, public health, and other interests likely to be affected by the work. The committee should formulate a scheme whereby the harmful effects of such an undertaking are prevented, and the cost of such preventive measures should be included in the estimate of the proposed engineering work. The preventive measures should be carried out before any harmful effects can be produced, and not delayed until these have already developed and become serious. As much attention should be given to measures for the removal of excess water as to the provision of water in irrigation schemes.

(2) *Increase in breeding places due to decrease of water*

In areas where, during the main malaria season, water is widespread like a sea, a marked decrease in the water surface leads to the formation of pools, with increased amount of water edge, and so an increased multiplication of mosquitoes. The great example of this in India would appear to be large areas of Lower Bengal. According to Bentley (1925), Willcocks, and many others, in the past these areas were covered by water from the Ganges—'inundation irrigation'—at certain seasons of the year. With the increase of embankments for the training of rivers, for roads, for railways, etc., this type of irrigation has been stopped, with the result that not only have the conditions for the

spread of malaria increased, but the land has become impoverished due to the absence of the valuable fertilizing silt which such water deposited. Bentley (1925), after a very careful study of the problem, came to the conclusion that these engineering works, usually built with the best intentions, have been responsible for conditions where 'agriculture, health and prosperity have suffered, millions of lives have been sacrificed, thousands of crores of rupees have been lost, the people are sunk in poverty and a vast proportion of them suffer each year from recurring attacks of malaria'.

General remedy.—The appointment of an expert commission to enquire into the causes of these awful conditions, and to formulate schemes whereby they can be ameliorated or eradicated, and prevented from increasing.

(B) *The introduction of human carriers of malaria into a healthy area, or of a relatively non-immune population into a malarious locality*

When any large industrial, engineering, mining or other project is undertaken in India, it is usually necessary to import labour for the work. These large 'aggregations of tropical labour' frequently suffer severely from malaria when introduced into a malarious area, or they may import malaria into a relatively healthy tract.

The incidence of malaria among these people, apart from its public-health importance, often produces serious difficulties in the labour problem. The completion of such large undertakings in the tropics is often hampered more by sanitary considerations than by engineering or industrial difficulties (Panama Canal, railway construction work, irrigation projects, mining industries, etc., etc.). In some instances, it has been found impossible to complete such works, or only at a very greatly enhanced expenditure, unless anti-malarial operations are actively undertaken (*vide* Sinton, 1936).

Apart from the effects of malaria upon the labourers themselves, the infection is liable to spread from these men to the inhabitants of the surrounding country, and to produce a high degree of prevalence or even epidemic conditions among them (docks at Bombay; railway construction in Rajshahi; roads in Burdwan, etc., etc.).

In addition to the immediate effects of such a spread of infection, the changes caused by engineering projects on the local physiographical and other conditions of the country, may lead to the continued prevalence or permanency of a high degree of endemicity of the disease (Burdwan district and many other parts of Bengal, water-logged areas in the Punjab, etc.). This is especially the case when such changes also give rise to economic stress, usually as the result of agricultural decline caused by the altered conditions.

General remedies.—The introduction of legislation to ensure proper sanitary and medical

arrangements in cases of 'tropical aggregation of labour', to prohibit the formation of conditions likely to affect the health of the local population, either temporarily or permanently, and to enforce measures for the abolition of any such harmful conditions as may be produced by these works.

(C) *Conditions leading to economic stress and lowered resistance of the population*

The appalling and tragic effects of malaria among certain aggregations of labour, where economic conditions are poor, and stress severely felt, have been fully described by Christophers and Bentley (1909). The sequence of events has also been pointed out by Sinton (1933).

The severe economic stress which follows upon water-logging has been described by many workers. Dempster (1848) and Taylor (1870) have given graphic descriptions of the miserable and malaria-stricken population who survived along the course of the old Western Jumna Canal, where water-logging, agricultural decline and economic stress prevailed. In more recent years, Gill (1922) and Lal and Shah (1933) have recorded a similar state of affairs in a water-logged area in the Punjab, while in the Madras Presidency, King *et al.* (1929) have drawn attention to such conditions at Mopad.

The relationship between impoverished soil, agricultural decline, economic stress and malaria has been emphasized by Bentley (1925) in relation to Bengal, and Fry (1914) speaks of the epidemics in certain areas of that province as 'deficiency epidemics'.

The conditions of economic stress with associated malarial prevalence mentioned above, have all been caused, either directly or indirectly, by large engineering or other works, and these have had a very adverse effect upon the health and prosperity of the people. Such conditions of economic stress have not only caused a rise in the direct mortality and morbidity due to malaria, but have also been responsible for increased sickness and death from other causes, among a population with a lowered resistance.

Discussion

While large engineering works in India, more especially those connected with irrigation and increased facilities for communication, have added much to the prosperity and wealth of certain parts of the country, in many instances they have been responsible for a great increase in the prevalence of malaria and economic stress in other areas. In some instances the end results have been so harmful as to annul almost completely the benefits which these works were intended to provide.

In the construction of large engineering works, the engineer naturally tries to complete the project as cheaply as possible, consistent with technical efficiency, and often takes no heed

of, or does not realize, the disastrous results to health and prosperity which may follow upon his operations. As has been truly remarked by Sir Malcolm Watson, 'engineering, which leaves a trail of malaria behind it, is bad engineering'.

The type of economy which gives rise to man-made malaria and agricultural decline is a false saving for any government, any department, or any commercial undertaking. The expenditure, which has to be incurred at a later date to ameliorate or remedy the harm caused, is usually very much greater than the initial outlay needed to prevent the damage. Apart from the public-health point of view, which is directly concerned with the mortality, the sickness and the suffering that these blunders cause before they are remedied, if this is ever properly done, there is the financial loss to the province or district in which they are allowed to occur. Many of these errors of omission and of commission have given rise, and are still giving rise, to agricultural decline, which must have cost the government and the community countless crores of rupees, and this apart from a great loss of efficiency among the labouring population of the malaria-stricken localities.

The urgent necessity for the institution of forceful measures to prevent the damage which is being done by man-made malaria in India, has been recognized for a very long time. Christophers and Bentley (1909) drew special attention to this factor in relation to 'tropical aggregation of labour'. Clemesha (1917), when Sanitary Commissioner with the Government of India, placed a memorandum before the Imperial Government, pointing out the evils which had arisen from the effects of certain large engineering works in India.

He stated that 'within the last decade, the science of epidemiology and preventive medicine have made enormous strides. Much of the work that has been done is naturally not known to Railway and Irrigation authorities and other large employers of labour, but the time has now come when co-ordination between these and the Sanitary Department is pre-eminently desirable'. He stresses the urgent necessity for the formation of expert committees to ensure such co-ordination.

The Hon'ble Mr. H. Sharp, Officiating Secretary to the Government of India, circulated Colonel Clemesha's remarks to all Local Governments and Administrations in 1919 (Sharp, 1919). He points out that questions connected with large aggregations of labour, the effect of borrow-pits and the interference caused by embankments upon the natural drainage of the country, had been engaging the attention of the Government of India for some time. He approved of the appointment of co-ordinating committees, and went on to say that the Railway Board have accepted these proposals, and 'the Government of India trust that similar steps will be taken in the case of public works under the control of the Public Works and other departments of Government'.

An executive order was passed by the Bengal Government in August 1921, in connection with new railway construction and anti-malarial work. Under this order before the actual construction of any new line was undertaken, a committee was to be appointed consisting of the Director of Public Health as Chairman, the Chief Medical Officer of the railway concerned, the Chief Engineer of the proposed construction and other important officers of the Civil Administration as members. This committee was to take note of the malarial conditions of the country through which the line was to travel; suggest the location of labour camps; and consider the subject of interference with natural drainage and the effect of borrow-pits on malaria. They were then to submit a report which would be sent finally to the Railway Board (Suhrawardy, 1928).

The 7th Congress of the Far Eastern Association of Tropical Medicine at their meeting in Calcutta in 1927 passed a resolution calling attention to the need for close co-operation between the public-health authorities and the engineers, in connection with such large engineering works in the tropics.

'The Malaria Section of the Seventh Congress of the Far Eastern Association of Tropical Medicine are aware of many instances of a great increase in the incidence of malaria caused by the facilities given to mosquito reproduction by engineering works, either during construction or afterwards, due to the different conditions brought about. This Congress is of opinion that plans of railways, canals, harbours and all similar engineering works likely to affect the conditions producing malaria should be submitted to the proper public-health authorities and their sanitary engineers before being sanctioned by Governments'.

A similar resolution was passed at the 12th Conference of Medical Research Workers at Calcutta in 1934.

'This Conference notes the rise of malaria that has occurred as the result of the Sind Irrigation Project and regrets that the definite early warnings of the Malaria Survey in this respect have apparently gone unheeded'.

'In future, in all provinces in India, before any irrigation or other major engineering projects are undertaken, there should be, where it does not already exist, compulsory co-operation between the Irrigation or other Departments concerned and the Public Health Department'.

The importance of the provision of proper sanitary precautions and the avoidance of operations likely to produce either a temporary or a permanent increase in malaria, cannot be too strongly emphasized either from the humanitarian, the financial, the labour or the agricultural standpoints.

The Panama Canal could not have been built but for the enforcement of anti-malarial measures of this kind, with which all other departments had to conform (Chamberlain, 1929). The success of the large works of agricultural 'bonification' in the malarious parts of Italy was hindered for many decades by the absence of such co-operation, and their full

benefits were only achieved when this was enforced (Ilvento, 1934). This has become so well recognized that legislation was passed to enforce it.

By the act of 1933, it was laid down that authorized schemes of 'bonification' must cover 'the planning, financing and operating not merely of hydraulic and agricultural works, but also the health services required to preserve the health of the labourers, peasants and superintending staff, without which every attempt must end in disaster. Such is the legal conception of the *bonifica integrale*' (Ilvento, 1934).

There are in India numerous examples of the good results which have followed upon the observation of these precautions in connection with large engineering works—the Raipur-Vizianagram line and some other railway projects, the Sara Bridge, the head-works of the Sarda Canal, the Mettur Dam, the Back-Bay Reclamation Scheme, Vizagapatam Harbour, to name but a few. Unfortunately, as can be seen from some of the examples cited earlier and those mentioned by Sinton (1935, 1935a), such essential measures are still being neglected in many places. There is still 'much of tragedy in the shape of lost opportunities, in the strangling hold of vested interests, in the stupidity, folly and pigheadedness, aye, and the wickedness, of those who oppose progress, who were deaf to the claims of science, who did their best to set back the clock' as an editorial in the *Lancet* (1924) expressed it.

One can understand perfectly the aim of the person responsible for such works, in attempting to get them carried out as cheaply as possible, in order to reflect credit on his department and to balance his budget. Unfortunately, the expenditure needed at a later date to remedy the harmful results produced, has to be found in the long run by the Government or other body concerned, and what was apparently a cheap job may become a very expensive one in money, mortality, morbidity, agricultural loss, economic stress and the many repercussions which these factors have upon the revenue and prosperity of the province or the community. Much of this wastage of money, men and material could have been avoided, if the after-effects had been foreseen and appropriate measures taken to prevent their occurrence.

The Governor of the Punjab, His Excellency Sir Herbert Emerson, in an address delivered this year (1935) at the opening of the Punjab Engineering Congress, points out the tendency of Government departments to look upon problems only from the aspect of how these affect the budgets of their own departments and not that of the province as a whole. He emphasizes the necessity of co-operation between different departments in the present and future interests of the finances of the provincial government as a whole and not that of their own departments only. He had instituted regular meetings between officers of all departments to

discuss problems of common interest, and he hopes that if co-operation is not established by certain officers 'the heads of the departments concerned will twist their tails to some effect'.

This lack of co-operation is affecting not only rural populations but also urban ones. The Malaria Commission of the League of Nations (1930), in the report of their tour in India, have called attention to the failure to deal with malaria in many Indian towns and cities.

'Although we adhere to our previous statement that rural malaria is the most important problem, we look upon it as a defect that the simple clear-cut conditions of urban malaria have not been controlled' (Malaria Commission, League of Nations, 1930).

The unsuccessful, or poor, results which have been reported in many parts of the world, when properly planned and feasible anti-malarial measures have been recommended, especially for urban areas, are, alas, too often due to the apathy, to the neglect, to the absence of co-operation, and even, in many instances, to the active opposition of either the non-official or the official populations, or both. The Malaria Commission suggest that, in some cases, the health and prosperity of the people have been sacrificed in the interests of political, religious, departmental, or other ends. The Royal Commission on Labour in India (1931) have also remarked upon the failure to undertake adequate anti-malarial operations, and Covell (1928, 1934) has noted upon this in relation to Bombay and Delhi. When these large and important cities are so backward, what can be hoped from smaller towns, if an example is not set for them?

'We need not insist on a history of all the attempts to carry out an efficient malaria control. Up to the present they have failed, not through want of sufficient knowledge or of means to carry them out, but through a deplorable lack of co-operation between the various authorities, through religious objections which must be respected in so far as they are sincere and not a weapon in the hands of politicians, and through agitation in certain sections of the Press, which would appear not to be aware of their great responsibilities' (Malaria Commission, League of Nations, 1930).*

'We have found only too often action on health matters ends with the holding of an investigation and the writing of a report, little effort being made subsequently to carry out even the simplest of its recommendations'† (Royal Commission on Labour in India, 1931).

This apathy and opposition have been felt in many more enlightened countries than India, and to overcome them very drastic steps have often been required.

'While public sentiment is still at sea, while our legislators, forgetting Beaconsfield's axiom that "the public health is the foundation on which reposes the happiness of the people and the power of the country",

*The Malaria Commission instance specially the cities of Bombay and Vizagapatam.

†A similar statement has been made by a Reviewer in the *Tropical Diseases Bulletin* (1935) in respect to New Delhi.

and ignoring his high challenge that "the care of public health is the first duty of a statesman", allow themselves to be duped or bribed into the support of movements against the public weal that would disgrace the dark ages, how can we hold up our heads in a scientific and cultured age?' (Wellman, 1913).

'As has been well said by the late William Edward Hartpole Lecky—"How different would have been the condition of the world and how far greater would have been the popularity of a strong monarchy if at the time when such a form of Government generally prevailed, rulers had had the intelligence to put before them the improvement of the health of the people and the prolongation of the lives of their subjects as the main object of their policy rather than military glory or the acquisition of territory or mere ostentatious or selfish display" (Hoffman, 1928). "Even the most stately grandeur is ineffective in subduing disease" (Celli, 1933).

'Even now malaria mosquitoes can be seen swarming in fairly thickly populated places simply because the inhabitants do not take the trouble to keep them down. It is generally the fault of municipal authorities. I certainly think that not enough discipline is exerted by British and European Governments to make local bodies in the tropics do their duty in this respect' (Mégroz, 1931).

This apathy, this neglect and this opposition are not only costing the local people and the nation very large sums of money through the continued prevalence of malaria (*vide* Sinton, 1935a), but have increased the expenditure required to carry out effective anti-malarial operations.

The widespread presence of man-made malaria is a very serious problem in India. In view of the enormous damage which this state of affairs has produced, and will produce in future, on the health and prosperity of the people of India, it appears to me that the time has come when all Governments and other bodies should pass, and *properly enforce*, appropriate legislation, regulations and rules to prevent the extension of this very serious evil. At the same time it should be made the duty of all those departments, bodies or persons responsible for the formation of such conditions, to be responsible also for the expenditure required to abolish them.

The expenditure needed for such work should be a legitimate charge upon the budgets of the departments or bodies responsible for the conditions, and *not* upon the Public Health or Medical budgets. The money available for the work of the latter departments is already too small to deal properly with the natural prevalence of malaria, without being further saddled with the burden of sickness, etc., produced through harmful and usually avoidable human activities.

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A PRELIMINARY NOTE ON THE TREATMENT OF NEURO-SYPHILIS WITH MONKEY MALARIA

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ASSISTANT SURGEON B. M. DAS GUPTA, L.M.P.
(From the School of Tropical Medicine, Calcutta)

KNOWLES and Das Gupta (1932) were the first to show that infection with a certain species of the monkey plasmodium could be transmitted to human beings. They infected three volunteers and found that in one the disease was extremely severe, in another it was of moderate intensity with a relapse, and in the third only a mild grade of intermittent fever resulted. Van Rooyen and Pile (1935) tried monkey malaria in the treatment of general paralysis of the insane on account of certain difficulties associated with the induction of benign tertian malaria for treatment of these cases in cold climates. They used a strain of *Plasmodium knowlesi* (Sinton and Mulligan, 1933) which they had transmitted to 12 human subjects. In all the patients on whom this treatment was tried, there was a good reaction followed by distinct improvement.

In November 1935, a patient suffering from optic atrophy with a history of syphilis and a moderately positive Wassermann reaction came to the senior author through Lieut.-Colonel E. O'G. Kirwan, I.M.S., Professor of Ophthalmic Surgery in the Calcutta Medical College, for treatment with malaria. In January 1936, a similar case with strongly positive Wassermann reaction was also admitted. As at this time suitable cases of benign tertian malaria were not available, it was decided to treat them both with the monkey plasmodium. The details of these cases are as follows:—

Case 1.—Hindu male, M. N. D., aged 36 years, was admitted to the Carmichael Hospital for Tropical Diseases on the 25th November, 1935, with dimness of vision and advanced optic atrophy. An examination of the blood showed a moderately positive Wassermann reaction. One eye was practically blind and in the other some central vision was left. On the 5th December, 1935, the patient was inoculated with *P. inui*. but up to the 3rd January, 1936, there was no rise of temperature and it appeared that infection had not taken place. On this date he was inoculated with 0.5 c.c. of blood from a *Silenus rhesus* monkey containing *P. knowlesi* (8,240 parasites per 1,000 leucocytes).

On the evening of the 18th January he first showed signs of getting a rise of temperature and on the 19th January an examination of the blood showed the presence of scanty rings. On the 20th and 21st of January the temperature rose to 102°F. with only slight remissions. On the 22nd January the temperature came down to 100°F. and the blood examination showed the presence of a few rings and growing trophozoites. On the 23rd and 24th of January the temperature kept up to 104°F. with slight remissions. On the 25th January it came down to normal in the morning but went up slightly in the evening. On the 26th January the temperature was normal and remained so. Examination of the blood on 29th January showed

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WE do not propose to review the mass of literature on the ætiology of epidemic dropsy. A selected and useful bibliography is given at the end of Chopra and Chaudhuri's (1935) report of an outbreak of epidemic dropsy in Purulia and Chopra and Bhattacharya's (1935) paper in the same number of the journal.

The one important fact that has emerged from the many studies that have been undertaken into the causation of epidemic dropsy is that rice is associated with the outbreaks of this disease. Acton (1922) first suggested that it is the infection of the rice that plays an important part in the ætiology of epidemic dropsy. Three years later Acton and Chopra (1925) described the infection of rice grains by spore-forming proteolytic bacilli belonging to the *vulgatus* group. The infection of rice grains was more liable to occur during the hot humid months of the monsoon, especially if the rice was stored in non-ventilated rooms. These workers held that certain poisonous water-soluble and thermostabile bases elaborated in diseased grains were responsible for the signs and symptoms of the disease. In 1927 these two workers reported the presence of Gram-positive bacilli in the stools of cases.

The evidence implicating the spore-forming bacilli, though strong, was not conclusive. An outbreak of epidemic dropsy in September 1934 gave us an opportunity to reinvestigate the subject.

The results of this inquiry are recorded in two parts: the first dealing with the bacteriological studies of the cases of epidemic dropsy and the second summarizing the results of the examination of samples of rice from different sources.

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(A) *Bacteriological study of cases of epidemic dropsy*

Careful bacteriological investigations were made of every case admitted to the Carmichael Hospital for Tropical Diseases. Material for examination was also collected from certain isolated outbreaks of the disease in Purulia and elsewhere. The examination included:—

(1) Bacteriological examination of blood was made in 77 cases. The blood was collected in two flasks of glucose broth. One flask was incubated aerobically and the other under anaerobic conditions. The flasks were kept under observation for three months. No organisms were isolated from any of the samples. In five samples contamination of the medium occurred after two months' incubation. The time of collection of samples of blood in relation to the duration of the disease is shown below.

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Showing the time after onset of the disease that the blood of epidemic dropsy cases was bacteriologically examined

Period after onset of disease	Number of patients in whom blood cultures were made
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Eight " or over ..	23
TOTAL ..	77

It will be seen that the majority of the blood cultures were made a month after the onset of the disease. This is due to the fact that the cases do not seek admission into hospital till the symptoms are well established. All the cases, however, showed active symptoms of the disease and some were pyrexial when the blood was collected.

In view of the paucity of the number of cases examined during the early stage of the disease the results obtained have only limited value. They do show, however, that even in protracted cases or cases in which frequent exacerbations occur, no organisms are found in the blood. This confirms Acton's findings.

(2) Catheter specimens of urine from sixty cases of epidemic dropsy were examined. The urine was collected during different stages of the disease and incubated in the same manner as the blood samples. In addition each sample of urine was incubated by itself and any growth plated out on Conradi's medium as well as MacConkey's neutral-red bile-salt lactose agar and nutrient agar. In about 10 per cent of the samples streptococci, mainly of the viridans

no parasites. No antimalarial treatment was given to this patient and the infection appeared to have died out spontaneously.

On the 31st January, this patient was re-inoculated with 0.8 c.c. of blood containing *P. knowlesi* (4,200 parasites, chiefly growing trophozoites and schizonts, per 1,000 leucocytes). No infection, however, resulted till the 16th February, when he was again given 4 c.c. of blood showing scanty rings from a patient experimentally infected with *P. knowlesi*. Up to the time of writing (26th February), there has been no rise of temperature and the examination of blood has shown no parasites.

The general condition of the patient has improved and he says that his vision is distinctly better. The patient was, however, examined by the ophthalmologist who reported that there was no change so far as the fields of vision and the condition of the retina were concerned. Whether by this treatment further progress of optic atrophy has been checked or not remains to be seen. The patient is under observation.

Case 2.—Mohammedan male, K. T. N., aged 25 years, had suffered from defective vision since 1926. From January 1934 to January 1935 he had four or five transient attacks of facial paralysis and there was rapid deterioration in the eyesight. The patient was examined by Lieut.-Colonel Kirwan, I.M.S., who found fairly advanced optic atrophy and referred him to the senior author for treatment with malaria. On admission the patient looked apathetic, gait somewhat spastic, pupils slightly dilated, reaction to light sluggish, the knee-jerks were dull, Babinski's sign present, ankle clonus absent, Romberg's sign absent and the speech was blurred and understandable with great difficulty. The mental condition of the patient was peculiar. He could answer questions intelligently sometimes, but often was very dull and could hardly comprehend anything. He was irritable and was upset on the slightest provocation. Examination of the blood showed the Wassermann reaction strongly positive.

On the 30th January, 1936, the patient was inoculated subcutaneously with 0.8 c.c. of blood from a *Sileneus rhesus* monkey infected with *P. knowlesi* (4,200 parasites, chiefly growing trophozoites, per 1,000 leucocytes). On the 6th and 7th February the patient had a cold in the head and had a slight rise of temperature which persisted from 8th to 11th February. No malarial parasites were found in the blood. Between the 11th and 13th February the temperature was normal but it started rising again on the 14th February. Examination of the blood on the 16th February showed the presence of a few rings; on the 17th February a few rings and scanty mature schizonts were present; on the 18th February 426 parasites—rings, growing trophozoites, developing schizonts and scanty gametocytes—per 1,000 leucocytes were present. The temperature rose to 104.6°F. and in the afternoon the patient became semi-conscious, had a good deal of rigidity of the neck, and could be roused with difficulty. In the evening the patient's condition became alarming and 0.1 gm. of atabrin was given by the mouth. In a few hours the patient's general condition was reported to be very much improved; he became conscious and the rigidity of the neck passed off. On the morning of the 19th February the patient was seen again by the senior author and it was found that the condition was similar to that found on the previous day and it appeared that he was passing into a semi-comatose state. There was also a marked yellow coloration of the skin. The temperature was 102.6°F. and blood examination showed the presence of 629 parasites (almost all phases) per 1,000 leucocytes.

As the patient had shown sensitiveness to atabrin 0.5 gm. of quinine was given by intramuscular injection. Within a few hours of the injection the temperature came down. On the 20th February the temperature came down to normal and all the symptoms passed off. The change in the condition of the patient was very remarkable. The rigidity in the neck

passed off, the patient became quite alert, answered questions intelligently and said he was much better. Examination of the blood at this stage showed a few trophozoites showing evidence of degeneration. On the 21st February scanty trophozoites in a marked state of degeneration were visible in the peripheral blood. On the 22nd February no parasites were seen in thick films.

Discussion.—The first patient showed a marked refractoriness to infection with *P. knowlesi*. After the initial inoculation there was a long incubation period, the temperature was never high and the infection died out spontaneously within a week. A second injection of 0.8 c.c. of blood was tried without infection resulting, whereas the same dose from the same animal given to another patient at the same time produced alarming symptoms. The complete failure of the second injection may be ascribed to a degree of tolerance being acquired by the patient on account of the previous infection.

The interesting points about the second case are high temperature with low parasite count similar to that seen in quartan infection, and the development of marked cerebral symptoms which were easily controlled with small doses of atabrin and quinine. It is too early to say yet how the condition of the eyes has been affected by the treatment, but there is no doubt that the reaction of the pupils to light is more brisk and the mental condition of the patient has greatly improved. He is no longer apathetic and is now demanding to go to his home and to his people. His speech though still blurred is clearer than before. An examination by the ophthalmic surgeon on the 26th February showed that so far as the fields of vision and the appearance of the retina are concerned there is no change. The patient is being kept under observation.

It may further be stated that it appears that an attack of monkey malaria in human subjects confers immunity or a marked degree of tolerance to re-infection. How long this tolerance is maintained is now being studied.

Conclusions.—Inoculation with *Plasmodium knowlesi* places in the hands of the clinician a good method of malarial therapy in the treatment of neuro-syphilis. It produces well-marked reactions which can be easily controlled by antimalarial drugs and is free from many of the disadvantages accruing from the treatment with ordinary benign tertian infection transmitted either by mosquitoes or by injection of the infected blood. A large number of patients will, however, have to be treated with this form of therapy before its value can be properly adjudicated.

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type, and a variety of other intestinal organisms were obtained. A few samples showed the presence of spore-forming bacilli but these were few and the findings irregular so that it was impossible to exclude extraneous contamination.

(3) Repeated cultural examination of the stools of 117 epidemic dropsy cases were made. The stools were plated on MacConkey's neutral-red bile-salt lactose agar and ordinary nutrient agar. Duplicate sets of plates were made and incubated under aerobic and anaerobic conditions. In all plates, but more abundantly on nutrient agar than on MacConkey's medium, colonies of Gram-positive spore-forming bacilli were found. As these colonies grew readily under aerobic conditions and more slowly under anaerobic conditions, the anaerobic method of cultivation was later abandoned.

It may be noted that in a small proportion of cases, a variety of non-lactose-fermenters were also found, but, as these organisms belong to the usual type of non-lactose-fermenters found in other hospital cases, no importance can be attached to these findings. Stools from 200 cases not suffering from epidemic dropsy and with no history of the disease were examined as controls. The results of these examinations are summarized in table II.

TABLE II

Showing the frequency of the finding of spore-forming bacilli in the stools of epidemic dropsy cases during different stages of the disease and the results of the examination of the stools of a control series of 200 individuals not suffering from epidemic dropsy

Type of case	Number examined	Number in whom spore-forming bacilli were isolated	Percentage positive
Epidemic dropsy during the first two weeks of the disease.	7	7	100
Epidemic dropsy from the 2nd to the 8th week of the disease.	106	103	97
During convalescence.	4	1	25
Control series of non-epidemic-dropsy individuals.	200	18	9

There was not a single case of epidemic dropsy in which we failed to isolate spore-forming bacilli in the early stages of the disease and for a period of two months after the onset spore-forming bacilli were recovered from almost all the cases.

In a certain number of the cases particularly with diarrhoeic stools, the plates inoculated with stools showed a very great preponderance of colonies of spore-formers. The number of convalescent cases examined is far too small for the results to have any significance. Spore-formers were recovered in 9 per cent of the control series of 200 individuals. It was impossible to obtain in the control series satisfactory histories to exclude contact with epidemic dropsy cases. The preponderance of Gram-positive bacilli was also noted in smears prepared from the stools of epidemic dropsy cases.

The spore-forming bacilli isolated from the stools of epidemic dropsy cases are similar in their main characteristics to the organisms described by Acton. The majority of the strains ferment glucose, maltose and saccharose with the production of acid only. Some strains are late fermenters of mannite and about 10 per cent of the strains ferment lactose. All the strains examined liquefy serum, agar and rice 'conji' medium and peptonize milk. They do not constitute a homogeneous group but differ both biochemically and serologically. In this present communication it is not proposed to go into the description and classification of the strains.

In order to incriminate, in the causation of epidemic dropsy, any of the strains of spore-forming bacilli isolated from the stools we examined sera of a number of cases for the presence of specific agglutinins. Four strains isolated at the beginning of the epidemic were found to be well agglutinable by the sera of epidemic dropsy cases. Table III summarizes the results of the examination of sera of epidemic dropsy cases for the presence of agglutinins against these organisms. Table IV shows the results of a similar examination of sera from individuals not suffering from epidemic dropsy. It might be stressed here that the control series of sera were obtained from individuals as far as possible of the same stratum of society as the cases themselves. It was impossible in many instances to obtain reliable histories excluding a previous attack or contact with actual cases.

It will be seen that although agglutinins for these organisms are present in a certain proportion of individuals not suffering from epidemic dropsy, the percentage and titres are much higher in the sera of epidemic dropsy cases. The number of sera examined are too few to justify any definite conclusions but the tentative conclusions arrived at during the course of this work are :—

(1) The agglutinins increase in amount as the patient becomes convalescent followed later by gradual decline in the titre.

(2) Agglutinins are present in cases of epidemic dropsy occurring in widely separated places.

TABLE III

Showing the percentage of sera from epidemic dropsy cases agglutinating at specified titre the spore-forming bacilli isolated from epidemic dropsy cases

Spore-formers from epidemic dropsy cases	Number of sera tested	TITRE						
		1 in 25 and over	1 in 50 and over	1 in 125 and over	1 in 250 and over	1 in 500 and over	1 in 1,000 and over	1 in 2,500 and over
7,348	89	76.4	75.2	65.1	46.0	15.7	9.0	2.2
7,363	89	80.9	76.4	52.8	34.8	9.0	1.1	..
7,708	22	18.1	9.0	4.5	..	..	..	..
7,427	36	39.0	26.8	19.5	4.8	..	..	..

TABLE IV

Showing the percentage of sera from individuals not suffering from epidemic dropsy agglutinating at specified titre the spore-forming bacilli isolated from epidemic dropsy cases

Spore-formers from epidemic dropsy cases	Number of sera tested	TITRE						
		1 in 25 and over	1 in 50 and over	1 in 125 and over	1 in 250 and over	1 in 500 and over	1 in 1,000 and over	1 in 2,500 and over
7,348	60	26.6	21.6	15.0	10.0	1.6	..	..
7,363	60	30.0	26.6	20.0	13.3	1.6	..	..
7,708	60	3.3	..	..	..	..	..	..
7,427	60	1.6	1.6	..	..	..	..	..

(3) Agglutinins are not present for other intestinal organisms picked up from epidemic dropsy stool plates.

(4) 'O' agglutinins were found in dilutions of 1 in 500 in three of the 5 cases where they were looked for. In the few control sera examined 'O' agglutinins were absent.

(5) Agglutinins for these organisms were not found in the five samples of fluid removed from the eye in cases of glaucoma due to epidemic dropsy, whereas they were present in the serum of these cases.

(6) In the few healthy individuals examined at the beginning of the epidemic and in individuals who do not eat rice or eat it only occasionally, agglutinins for the spore-forming bacilli were not found.

Unfortunately, owing to the cessation of the epidemic, it was not possible to continue this work. The results recorded above, however, fully confirm Acton's work. The development of agglutinins against spore-forming bacilli is additional evidence in support of the incrimination of these spore-formers in the aetiology of epidemic dropsy. It is however possible that these organisms are associated with the disease in the same manner as the proteus group of organisms are with typhus fever.

Various experiments designed to reveal anything of the nature of a filtrable virus were performed. Filtrates of ground-up sarcoids were injected into animals and man but with negative results.

Serum from convalescent and recovered cases of epidemic dropsy when injected intradermally in cases with well-marked erythema showed no blanching of the skin.

Filtrates of stools from epidemic dropsy cases cause slight but definite flocculation of convalescent serum. This flocculation was not obtained with filtrates of stools from healthy individuals. This work is in progress and is being extended to filtrates obtained after the growth of the implicated organisms in different media.

(B) *The study of rice associated with and not associated with outbreaks of epidemic dropsy*

A very large number of samples of rice were collected from sources associated with outbreaks of epidemic dropsy and not associated with outbreaks of epidemic dropsy. The latter were obtained from places where there were cases of epidemic dropsy but no evidence of the implication of the particular samples of rice with the disease and from areas free from the disease. The methods of examination of the samples of rice were on the same lines as those adopted by Acton and are outlined below:—

(1) Naked-eye appearance for the quality, grade and infection of the rice sample.

(2) 'Water-test' for the presence of opacity in the grain.

(3) Bacteriological for the isolation of organisms from the infected grains.

Summary of the method employed:—

(a) Infected grain placed in commercial formalin for five minutes.

(b) Grains washed repeatedly with saline and, allowed to remain in saline for two hours. This last is to soften the grain to facilitate the subsequent cutting.

(c) The grains are cut with a sterilized scalpel and planted with the cut surface to the medium (nutrient agar). On one half of the plate whole grains are planted in rows. This latter serves as a control of the efficient sterilization of the surface of the rice grain.

Good growth is usually obtained within 48 hours. The plates were incubated and observed for a week.

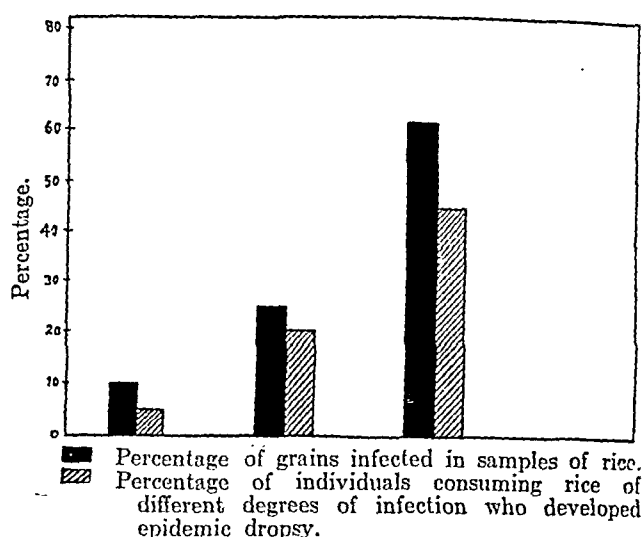
Table V shows the results of the examination of rice collected from houses (a) where there were cases of epidemic dropsy and (b) not directly associated with epidemic dropsy.

This is also shown graphically below.

Tables V and VI and the graph show that the incidence of epidemic dropsy is associated with the consumption of diseased rice. Rice showing greater degrees of infection are associated

with a larger number of actual cases of the disease.

GRAPH TO TABLE VI



Fifty-seven samples of rice were obtained from Rangoon; 41 of these were from houses where there were cases of epidemic dropsy and

TABLE V

The number of samples of rice examined, the percentage of samples diseased and also the main varieties of rice samples from (a) houses in which there were cases of epidemic dropsy and (b) from other sources not directly implicated with outbreaks of epidemic dropsy

	From E. D. houses		From other sources	
Total number of samples examined	163		170	
Number of samples of rice showing 10 per cent or more grains infected.	107		18	
Percentage of samples of rice infected	65.6		10.5	
Variety of rice	Sun-dried	Parboiled	Sun-dried	Parboiled
Number of samples	104	59	125	45
Number of samples of rice showing 10 per cent or more grains infected.	54	53	15	3
Percentage of samples of rice infected	51.9	89.8	12.0	6.6

TABLE VI

Showing the degree of infection of the rice samples as judged by the number of diseased grains, and the number of cases of epidemic dropsy associated with these samples

	Total number examined	Number of samples showing no infected grains	Number of samples showing infection of under 10 per cent of the grains	Number of samples showing infection of 10 to 25 per cent of the grains	Number of samples showing infection of over 25 per cent of the grains
Samples associated with epidemic dropsy cases.	157	Nil	157 or 100%	152 or 97%	97 or 62%
Samples not associated with epidemic dropsy cases.	100	57 or 57%	43 or 43%	13 or 13%	6 or 6%

16 samples were collected at random from various rice godowns. Table VII shows the results of the examination of these samples.

A few healthy samples of rice were received from houses where there were cases of epidemic dropsy. There was no indication however as to

TABLE VII
Showing the results of the examination of samples of rice from Rangoon

	From E. D. houses		From rice godowns	
Total number of samples examined	41		16	
Number of samples of rice showing 10 per cent or more grains infected.	41*		10	
Percentage of samples of rice infected	100		62	
Variety of rice	Sun-dried	Parboiled	Sun-dried	Parboiled
Number of samples	41	..	11	5
Number of samples of rice showing 10 per cent or more grains infected.	41	..	9	1
Percentage of samples of rice infected	100	..	82	20

* These showed very heavy infection, certain samples showing as much as 100 per cent infected grains.

Samples of rice from epidemic dropsy centres or from houses in which there was an outbreak of epidemic dropsy show varying degrees of infection. These samples include rice of different qualities, from the most expensive to the cheapest, both sun-dried and parboiled. One particular sample of rice which was incriminated in outbreaks of the disease in more than one house and where reliable information was obtainable showed a very heavy infection.

the length of time the particular sample had been in use and it was impossible to obtain reliable data. Certain other apparently healthy samples received from similar sources showed a large number of fragmented grains and brushings which latter were heavily infected.

Samples of rice not associated with outbreaks of the disease and from non-epidemic-dropsy centres show in a small number of samples the naked-eye appearances of infection. This

TABLE VIII
The fermentation reaction of 42 strains of spore-formers isolated from rice implicated with outbreaks of epidemic dropsy

Group	Number of strains in the group	Lactose	Dulcitate	Salicin	Mannite	Maltose	Glucose	Saccharose
1	22	..	..	A	A	A	A	A
2	6	..	..	..	A	A	A	A
3	5	..	..	A	A	..	A	A
4	3	..	..	..	A	A	A	A
5	3	A	..	..	A	A	A	A
6	2	..	..	..	A	..	A	..
7	1	..	A	A	A	A	A	A

TABLE IX
Showing the percentage of sera from epidemic dropsy cases agglutinating at specified titre the spore-forming bacilli isolated from infected rice as compared with sera from healthy individuals

Sera from	Number examined	TITRE			
		1 in 25 and over	1 in 50 and over	1 in 100 and over	1 in 200 and over
Epidemic dropsy cases	26	80.7	65.3	34.6	19.2
Healthy individuals ..	25	48.0	32.0	12.0	0.0

macroscopic evidence of infection in the form of a central opacity in the rice grain is also to be seen in many of the imported rices. There is tentative evidence to suggest that the infection in these samples is by a different group of soil or plant bacteria.

The bacilli isolated from infected rice grains are similar to those isolated from epidemic dropsy cases. They all liquefy gelatin, serum, agar and rice 'conji' medium and peptonize milk. The fermentation reaction of 42 'rice' strains studied is given in table VIII.

Representative strains from the group containing the largest number of strains were selected for agglutination with the sera of epidemic dropsy cases and as a control with sera of healthy individuals. The results are shown in table IX.

These results show the presence of agglutinins both in the epidemic dropsy cases and in the control healthy individuals belonging to the same social group as the epidemic dropsy cases. The frequency is, however, much greater in the epidemic dropsy cases.

Conclusions and Summary

The bacteriological findings in epidemic dropsy described by Acton and Chopra were fully confirmed by our results. Gram-positive spore-forming proteolytic bacilli were found in stools of every case of epidemic dropsy and similar organisms were found in infected rice grains.

These organisms are heterogeneous in their biochemical and serological properties. A good deal of work still remains to be done before the identity of these Gram-positive spore-forming bacilli is definitely established.

We have presented evidence to show that agglutinins against these organisms develop in cases of epidemic dropsy. Such agglutinins are also to be found but in much lower titre and not so frequently in apparently healthy individuals in Calcutta. The frequency of such agglutinins in different communities such as rice-eaters and non-rice-eaters still remains to be determined. From the few cases that we have examined there is evidence to suggest that such agglutinins are not present in non-rice-eaters.

These serological findings are an additional link in the chain of evidence to show that epidemic dropsy is of an infective nature and is associated with the presence of certain organisms in rice grains. It is possible however that the rôle played by these organisms in the ætiology of the disease is of the same nature as that of the proteus group of organisms in typhus fever.

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A NEW TYPE OF CHOLERAPHAGE— TYPE M

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IN 1929 d'Harcelle, Malone and Lahiri (1930) described very clearly three different races of cholera phage and as their work has been overlooked by subsequent workers we give verbatim the original account of these workers. 'One race of bacteriophage might provoke complete clearing of the medium; in another race the action might be slower and clarification complete only after 12 or 24 hours; in yet another race the action might only be partial, a portion only of the vibrios being destroyed and the medium not even noticeably cleared. Between total destruction of the vibrios in two hours and a destruction so weak that it must be anticipated to be perceived all intermediate stages can be found'. This account of three races of cholera phage is applicable in its entirety to the types A, B and C described a year later by Asheshov (1930). Two years later, we (1932 and 1932a) reported three further types (D, E and F) which were soon followed by types G, H and J reported by Morison (1933), and type K by ourselves. Type L was added to the list of cholera phage types by Anderson in 1935.

Asheshov, Asheshov, Khan, Lahiri and Chatterji (1933) gave a brief description of the five different types of cholera phages then existing. We are not aware of any detailed description of the types of phages since described. Some of the types are still incompletely studied, particularly types H and L which possess certain peculiarities in that they are difficult to propagate and filter.

The one characteristic of all types of cholera phage is that they possess reciprocal action; the secondary cultures obtained after the action of any one type is lysable by the remaining types of cholera phages. To the 11 types of cholera phage (A to L) which possess this characteristic reciprocal action we have added another type which we have called type M.

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Isolation of cholera phage type M

Strain no. 609/C.H./1935—an inagglutinable strain from a cholera case which was resistant to all the known types of cholera phage—was found to be weakly lysable by our mixture of samples of natural phages collected during the latter half of the year 1935. This phage was enhanced and purified by repeated passage and isolation on this strain. It was then found to lyse a culture of agglutinable cholera vibrios made resistant to all the known types A to L.

Characteristics and properties of cholera phage type M

Cholera phage type M is a slow-acting bacteriophage which gives an incomplete lysis in liquid medium. On solid medium it acts



Photograph showing the varying size of plaques formed by cholera phage type M. The photograph has been enlarged $2\frac{1}{2}$ times.

well giving rise to definite clearing and an undermined edge, secondary colonies appear readily and in 48 hours the clearing produced by phage action is almost filled up with the secondary culture. The plaques formed are extremely minute, undermined and smaller than those formed by type A. There is a very great tendency for variation to occur in the size and characters of the plaques (*vide figure*). It may be noted that this tendency to variability in plaque formation is not peculiar to this type of cholera phage but occurs with other types of cholera phages as well though not so readily.

This bacteriophage acts both on rough and smooth vibrios and has a very wide range of activity. All ultra-pure cholera vibrios are lysed by it. It also acts on a large proportion of aberrant agglutinable vibrios and on 7 per cent of the 288 inagglutinable vibrios tested. Its rate of multiplication is $n \times 10^1$ in two hours. The maximum multiplication being $n \times 10^{10}$. From the number of cholera cases examined during the inter-epidemic period this type was not found. Its frequency in Nature has not as yet been determined.

With the addition of type M we have 12 different types of cholera phage each of which possess the property of reciprocal activity. Although they all act on ultra-pure cholera vibrios, they vary considerably in the effects they produce singly or in combination. Of the 12 types described so far there is only one type—type A—whose action is restricted to agglutinable vibrios only and of these only the ones which possess a considerable amount of smooth element. All the other types (types B to M) lyse a certain number of inagglutinable vibrios. Certain of these types bring about marked changes in the antigenic structure of vibrios. Smooth strains are turned rough or the reverse change can occur, and agglutinable strains become either only partially agglutinable or completely inagglutinable.

From some of our own unpublished observations we have found that type A stands out from all other types in being antigenically distinct. Type A antiphage serum inhibits only type A cholera phage whereas the other types appear to be related serologically. With the addition of new types this work has to be repeated and the previous results revised and amplified. We have in cholera phage a bacteriophage which has been studied in considerable detail. It has already been resolved into 12 component types, a study of which will considerably advance our knowledge of bacteriophage. Added to the twelve types of cholera phage we have a number of races of vibriophages, using the term vibriophage for those phages which are active on inagglutinable vibrios and which if active on agglutinable vibrios do not give the reciprocal cross test. These in themselves deserve very careful study. We (1932a) have already shown that under the influence of certain races of vibriophages, some strains of inagglutinable vibrios acquire the property of agglutinability and become indistinguishable from the so-called authentic cholera vibrios. It cannot be stressed too strongly that in any bacteriological study of vibrios cholera phages and vibriophages must play an important rôle.

Summary

A new type of cholera phage—type M—is described. The importance of bacteriophage in the study of vibrios is stressed.

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DESCRIPTION OF *BACTERIUM* *PSEUDO-CAROLINUS*

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THE records of the routine work carried out in the bacteriological laboratory of the School of Tropical Medicine during the past nine years show that the commonest non-lactose-fermenting bacilli isolated from stools resemble

1917 (Castellani and Chalmers, 1919). An analysis of the intestinal non-lactose-fermenters isolated during 1934 extracted from the report of the department (Pasricha, 1935) is a typical example of the findings each year.

The 3,675 specimens of stools examined from the Carmichael Hospital for Tropical Diseases were collected from 1,220 inpatients. Very few of the patients were suffering from acute bacillary dysentery; the majority of the patients were suffering from vague abdominal symptoms or were those in whom the clinical condition was suspected to be due to some intestinal infection. From the 3,675 specimens examined we isolated non-lactose-fermenting organisms from 691 samples. The number of times and the

Organism	SPECIMENS OF STOOLS, 3,675		FROM 1,220 INPATIENTS	
	Number of times found	Incidence, per cent	Number of patients in which found	Incidence, per cent
(1) <i>Bact. shigæ</i>	1	0.02	1	0.08
(2) <i>Bact. flexneri</i>	28	0.76	15	1.22
(3) <i>Bact. sonne</i> .. ..	..	..	..	..
(4) <i>Bact. morgani</i>	45	1.22	32	2.62
(5) <i>Bact. pseudo-carolinus</i>	167	4.54	92	7.54
(6) <i>Bact. asiaticus</i>	100	2.72	58	4.75
(7) <i>Bact. pseudo-asiaticus</i>	32	0.88	20	1.63
(8) <i>Bact. pseudo-asiaticus mobilis</i>	14	0.38	11	0.90
(9) <i>Bact. para-asiaticus</i>	21	0.57	17	1.39
(10) <i>Bact. alkaligenes</i>	131	3.53	77	6.31
(11) <i>Ps. pyocyanea</i>	52	1.41	41	3.36
(12) Other non-lactose-fermenters	100	2.72	..	..
TOTAL ..	691	8.91	364	29.83

in their fermentative properties the *Bacillus pseudo-carolinus* described by Castellani in

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number of cases from which these organisms were isolated is shown in the above table.

These figures cannot be taken to represent the real incidence of bacterial infections in Calcutta, but they give an idea of the comparative frequency of the different organisms. Nearly 30 per cent of the patients admitted into the hospital for various diseases were found to pass non-lactose-fermenting bacilli. The organism most frequently found in the samples was *Bact. pseudo-carolinus*.

Attention has been drawn repeatedly to the frequency of the association of this bacillus to various conditions, from acute dysentery to vague abdominal symptoms. We have found this organism in almost pure culture in some cases of acute dysentery in which, in spite of repeated search, no other causative organism was isolated. Acton (1928 and 1929) and Acton and Knowles (1928) found this organism frequently in cases of sprue and chronic intractable dysentery. In 1929 and again in 1930 Acton (1930 and 1931) reported extremely good results in the treatment of cases of chronic colitis with autogenous vaccines of this organism.

One of us (Pasricha, 1931) recorded an experiment in which an agglutinable *Bact. flexneri* strain, after the action of bacteriophage, lost the property of agglutinability with *flexneri* specific serum and the secondary colonies fermented glucose, mannite and maltose with the production of acid and gas. A strain of *Bact. flexneri* had under the influence of bacteriophage acquired the fermentative properties of *Bact. pseudo-carolinus*. A year later Acton (1932) reported that, in certain cases of acute dysentery in which *Bact. flexneri* had been isolated during the early stages of the disease, *Bact. pseudo-carolinus* was found during the later stages, and that such findings were more frequent in those cases in which bacteriophage had been used therapeutically.

In 1933, one of us (Pasricha, 1934) reported that certain variants of *Bact. flexneri* produced after the action of bacteriophage resembled *Bact. pseudo-carolinus*, not only in their biochemical reactions but also that certain variant colonies exhibited serological similarity.

Chopra and Chaudhuri (1934) analysed a series of 40 cases in which from the clinical evidence and the results of vaccine therapy they concluded that this organism played an important part in the production of symptoms.

These records, which we have briefly referred to, are all from the work carried out at the School of Tropical Medicine. We are not aware of any other work dealing either with the study of this organism or its association and implication with diseased conditions.

In the table of aerobic asporogenous intestinal bacilli Castellani describes *B. pseudo-carolinus* as non-motile, Gram-negative, indol-positive, Voges-Proskauer-negative, and fermenting the following sugars with the production of acid and gas:—glucose, mannite, maltose, raffinose, arabinose, galactose, levulose, and sorbite with the production of acid only. It does not ferment lactose, saccharose, dulcitol and inulin, and it produces no change in litmus milk and no liquefaction of serum and gelatin. Castellani in the same table gives a description of another organism which differs from his *B. pseudo-carolinus* in that it is motile. This last organism Castellani placed in the genus *Salmonella* and classified it in the paratyphoid-asiaticus group. Because of the indol production he placed it in the asiaticus division of this group. *B. pseudo-carolinus* would be placed in the same group but differentiated from *B. carolinus* in that it is non-motile whereas *B. carolinus* is a motile organism. Castellani has not described, as far as we are aware, the serological properties of *Bact. pseudo-carolinus*, nor assigned any pathogenic effects to this organism.

We have not found any reference to this organism in literature except that outlined above, and Bergey (1934) does not include any description of this organism. Since this organism is one of the commonest non-lactose-fermenting

intestinal organisms found in Calcutta and evidence is accumulating to show that it possesses pathogenic properties, it is essential that a description of this organism should be recorded and, in the light of modern knowledge, its systematic position determined.

We selected 42 strains which, on isolation, gave the biochemical reactions similar to Castellani's *Bacillus pseudo-carolinus*, or as we would prefer to call it *Bacterium pseudo-carolinus*. It should be noted here that the reading of 'sugar' fermentation after 24 hours' incubation, as is usually done in diagnostic laboratories, is not sufficient to differentiate this organism. To illustrate this point we selected a series of 70 strains which, after 24 hours' incubation, gave the 'sugar' reactions of *Bact. pseudo-carolinus*. On further incubation, 28 of these strains fermented lactose with the production of acid or acid and gas. The majority of these 28 strains fermented lactose within 72 hours, the rest within five days. These late lactose-fermenters were not included in our series.

Of the 42 patients from whom this organism was recovered, only a few were suffering from acute dysentery with typical blood and mucus in the stools, the majority of the patients had vague abdominal symptoms and a few no symptoms referable to the intestinal canal. Agglutination tests with their serum against the homologous organism were carried out in 26 cases; 19 were negative, two showed agglutination in dilution of 1 in 25, two in 1 in 50, two in 1 in 100, and one in 1 in 320.

The 42 strains fall into three main groups as judged by their fermentative properties. Minor variations occur when a large number of test carbohydrates are used but with the 'sugars' generally used (lactose, glucose, mannite, maltose, dulcitol, saccharose, salicin in peptone water with Andrade's indicator and litmus milk) three main biochemical groups can be differentiated.

All the strains fermented glucose, maltose and mannite in 24 hours producing acid and variable amounts of gas. Nine of the 42 strains gave acid and gas production in salicin after 48 hours, but within seven days. Fourteen per cent of the strains fermented dulcitol, but often late. These fermentative properties proved constant at re-examination carried out several times during the two years that these strains have been under observation. On the basis of the fermentation reactions the strains form a single group with a few strains that are late fermenters of dulcitol or salicin. A brief description of the organism is given below.

Description of Bact. pseudo-carolinus

The bacilli resemble *Bact. coli* in shape and size and are arranged singly, in pairs, or in short chains. There are no spores, no capsules and the bacilli are non-motile (tested in fluid medium after varying periods of growth). They

stain easily with ordinary aniline dyes, are Gram-negative and non-acid-fast. On nutrient agar plate, after 24 hours' growth at 37°C. the colonies are round, greyish-white, opaque, amorphous in structure about 2 mm. in diameter with smooth glistening surface, and an entire edge. The emulsifiability of a colony is easy. After seven days the colonies increase to about 1 cm. in diameter and the edge is often markedly lobulated with radial striation from the centre. This lobulation occurs more readily on MacConkey's medium and is often marked within 48 hours. Lateral offshoots are sometimes present. In some strains, particularly old laboratory strains, rough variants develop. On nutrient agar slope, after incubation at 37°C. for 24 hours, there is a luxuriant growth resembling that of *Bact. coli*.

In broth there is a copious growth with uniform turbidity and a slight viscid sediment. There is no surface growth in the majority of the strains; in some strains a powdery pellicle develops. There is no odour.

In glucose-agar-shake after 24 hours there is disruption of the medium and the medium is driven up to the plug. On gelatin and Læffler's serum, good growth is obtained but no liquefaction of the medium occurs. On potato there is a colourless confluent growth.

It is an aerobic and facultative anaerobic organism. There is no lysis of sheep or rabbit's red cells. The majority of the strains ferment glucose, maltose, mannite, arabinose, galactose, lævulose with the formation of acid and gas and sorbite with the production of gas only. It produces no change in lactose, saccharose, inulin, inosite and raffinose. A few strains ferment in addition salicin, dulcitol or xylose with the formation of acid and gas. It produces an initial slight acidity in milk which in three to seven days becomes alkaline. There is no clotting of milk. It forms indol; Voges-Proskauer reaction is negative; methyl-red is positive; nitrates are reduced; methylene blue is partially reduced; hydrogen sulphide and ammonia are not produced; and it gives a marked catalase reaction.

Experimentally *Bact. pseudo-carolinus* kills mice within five days when injected in 1 c.cm. dose (approximately 2×10^9 organisms) of a killed culture intraperitoneally. A similar dose of *Bact. flexneri* kills in two to three days.

By agglutination and absorption tests this organism shows no antigenic relationship to the other known organisms in the *Salmonella* group. Serologically it is extremely heterogeneous, sera prepared with strains agglutinate the homologous strains only. Although by direct agglutination tests it shows no relationship to *Bact. flexneri* under suitable methods of cultivation but under the action of bacteriophage it shows distinct antigenic relationship to *Bact. flexneri*.

We have already referred to the changes induced in a strain of *Bact. flexneri* in which after the action of bacteriophage colonies were

obtained which not only gave the biochemical reactions of *Bact. pseudo-carolinus* but also showed serological relationship. We have recently been able to observe the reverse change. A strain of *Bact. pseudo-carolinus* isolated originally from a single-cell colony and maintained in culture for two years was lysed by bacteriophage. The secondary cultures obtained fermented glucose, mannite, and maltose with the production of acid only and were partially agglutinable with *flexneri* polyvalent serum. These changed fermentation reactions as well as the agglutinability have been maintained for six subcultures. This strain is still under investigation.

We have recorded these observations on the changes induced in *Bact. flexneri* and *Bact. pseudo-carolinus* under the influence of bacteriophage not only because they illustrate the profound changes induced in an organism under its influence, but also in view of the recent findings of Boyd (1936).

Boyd records that his no. 88 is numerically the most common of his 'new' types of dysentery bacilli in India. It differs biochemically from the V-Z races of *flexneri* in that about one-third of the strains isolated are late dulcitol fermenters. This organism, according to Boyd, shows a fairly close antigenic relationship to the V-Z 'spectrum', but is only feebly agglutinated by a V-Z polyvalent serum. It possesses a main antigen peculiar to itself.

According to Boyd this organism no. 88 presents certain features of great interest. Although differing in its biochemical relations no. 88 has been shown by Dr. W. M. Scott to be identical in its antigenic composition to the organism known in England as the Newcastle dysentery bacillus, which has been proved responsible for several small outbreaks of dysentery in England and elsewhere. Further, a strain having the biochemical characters of the Newcastle bacillus has been isolated from a case of dysentery in Bareilly. Boyd regards the discovery of the Newcastle dysentery bacillus in India as a matter of considerable importance, as it had hitherto been the practice in military laboratories to discard non-motile gas-forming organisms isolated from cases of dysentery. We have had in our collection for nearly two years one strain of Newcastle obtained from Kasauli. It gives the biochemical reactions of our *Bact. pseudo-carolinus*.

Although much work on the antigenic structure of these organisms remains to be done before their systematic position can be finally determined the facts recorded strongly suggest that the Newcastle bacillus is in reality *Bact. pseudo-carolinus*. We have already shown that a certain number of strains of *Bact. pseudo-carolinus* are late fermenters of dulcitol. This was not described by Castellani. Further, we have obtained from a strain of *Bact. pseudo-carolinus* variants which resemble Boyd's no. 88

and show antigenic relationship to the V-Z 'spectrum' of *flexneri*. The serological behaviour of the variant colonies obtained after the action of bacteriophage is further evidence of these bacilli belonging to a large group of organisms which possess a certain antigenic relationship and of which the only group that we know the antigenic structure is the V-Z group of *flexneri*. There are many anomalous findings which still have to be cleared up. Many of the strains are unstable, and show considerable variations both in their serological and biochemical properties. Evidence is gradually accumulating to show that many strains of intestinal bacilli isolated from time to time from cases of intestinal disturbances are variants of a group of antigenically related organisms. Various environmental factors, one of which is bacteriophage, play an important rôle in bringing about these changes and we are convinced from our own observations on the changes induced by bacteriophage in the test tube that no real progress in the study and rational classification of the dysentery bacilli will be made unless that study includes a careful consideration of all the environmental factors of which bacteriophage is one that we can easily control and study *in vitro*. Unfortunately much of the progress is retarded by the orthodox bacteriologist refusing to discard the now thread-bare belief in the fixity of species. We have shown that in the cholera vibrio profound changes can occur under the influence of bacteriophage. Similar changes occur in *Bact. flexneri* and *Bact. pseudo-carolinus*. We have observed changes in fermentative and serological properties and even in motility.

There is enough experimental proof to implicate *Bact. pseudo-carolinus* as a potential pathogen of the intestinal canal. Observations on this organism have been in progress for over nine years at the School of Tropical Medicine.

During 1934, we carried out a survey to determine the presence of agglutinins against this organism in a series of 250 hospital inpatients. The results of this survey are shown in the following table :—

TABLE

Showing the percentage of agglutinating sera obtained from 250 hospital in-patients at specified titre with a well-agglutinable strain of *Bact. pseudo-carolinus*

	1 to 25 and over	1 to 50 and over	1 to 100 and over	1 to 200 and over	1 to 400
Percentage of sera agglutin- able.	48	38	20	7	2

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PITFALLS IN OPHTHALMIC PRACTICE

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BEFORE any discussion is taken up on the mistakes that are commonly met with in the everyday practice of ophthalmology, the first

(Continued from previous column)

It will be seen that a very large percentage of the 250 in-patients examined showed agglutinins for this organism. This at first sight appears to be a very high percentage particularly as only one strain was employed in the test but when it is remembered that from 7 per cent of these individuals we were able to recover *Bact. pseudo-carolinus* these results are not so extraordinary.

Summary

(1) The literature on *Bact. pseudo-carolinus* is reviewed.

(2) As this organism has not been fully described before, a description of *Bacterium pseudo-carolinus* is given. On the basis of Bergey's classification this organism belongs to the genus *Salmonella*; its exact position in that genus is not determined.

(3) Variant colonies were produced in a strain of *Bact. pseudo-carolinus* after the action of bacteriophage. These variants lost the property of producing gas in the fermentation of carbohydrates and showed antigenic relationship to *Bact. flexneri*.

(4) A suggestion is put forward that the so-called Newcastle dysentery bacillus and *Bact. pseudo-carolinus* are the same. Further, Boyd's dysentery bacillus no. 88 is similar to the anærogenous variant colonies of *Bact. pseudo-carolinus*.

(5) Evidence is recorded to show that *Bact. pseudo-carolinus*, one of the commonest non-lactose-fermenters, possesses pathogenic properties.

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point that should be stressed is the fact that eye affections are, in the majority of cases, secondary, that is, they are either a localized manifestation of some general disease or an extension from the neighbouring structures.

The lid and conjunctiva.—A patient comes to a doctor complaining of trouble in his eyes. On examination the doctor finds the skin of the eye is excoriated, eczematous and the conjunctiva red and discharging. The diagnosis is chronic conjunctivitis with secondary blepharitis and immediately the doctor rushes on and prescribes the usual treatment for these local conditions. If he were only a little more careful in his examination, he would probably find that the patient was suffering from a generalized affection of the skin, for instance impetigo, furunculosis or ringworm, or some such affection of the scalp and forehead as seborrhœa or acne rosacea. In these cases the eye is either being showered with micro-organisms, or infection is carried to the eye by infected fingers. Unless the skin condition is attended to, the eye will fail to improve with treatment or may even actually get worse.

Another common cause of chronic conjunctivitis and blepharitis especially of the angular type is an infected tear sac. Until this is removed, for there is really no other alternative way of dealing with an infected sac, the conjunctival condition will evade all treatment. Chronic conjunctivitis causing a great deal of discomfort in the eye with very few objective signs can often be traced to a patient's occupation requiring exposure of the eyes to dust, glare and irritants over a prolonged period. Times without number such cases have been diagnosed as trachoma or granular lids. The patient is given various kinds of treatment consisting mostly of applications of caustics and irritant drugs. A pair of protective goggles, a mild salve or lotion and a few drops of liquid paraffin daily are all that are required to cure the trouble.

Granules and follicles.—Much confusion centres around these two terms. Granules or follicles are collections of lymphoid tissue in the sub-epithelial layer of the conjunctiva. The presence of these without any symptoms is of absolutely no significance and requires no treatment. Granulosis may be a localized manifestation of a general lymphoid hyperplasia and is physiologically present in young children in whom we also find a hyperplastic condition of similar tissues, namely spleen, thymus, tonsils and adenoids. The same condition is found in older children of a 'tuberculous diathesis'. Phlyctenulosis is a condition of the same group but with more serious ocular manifestations.

Spring catarrh or vernal conjunctivitis is due to constitutional causes of the same type. In the treatment of this disease attention should be paid to the constitutional causes. Plenty of

good food, sunshine, fresh air, the eradication of septic foci in the teeth or tonsils. The eye itself requires little or no treatment.

Trachoma is an exception to the above types of eye disease. The ætiology of the disease is still unknown but the consensus of opinion regards it as an infectious disease in which the infective organism, which has not yet been discovered, is supposed to lurk in the 'trachoma granules'. The presence of these granules has been the causation of the various kinds of destructive measures employed in the treatment of trachoma, namely, the eradication of granules by expression, cauterization or application of caustics such as copper sulphate and silver nitrate solutions. Nowadays, more attention is paid to the building up of the patient's own defences and destructive treatment has been discarded in favour of milder applications, namely, 0.5 per cent copper sulphate drops and weekly painting of the eyelids with 1 per cent to 2 per cent silver nitrate solution. This treatment should be carried out over a period of at least six months.

Copper sulphate stick has long been regarded as a specific in the treatment of trachoma. Nothing can be said too strongly to condemn this practice in India; copper sulphate destroys the raw and young corneal tissues and hence its use is absolutely contra-indicated in the presence of corneal ulcers which are frequently met with in the course of the disease.

One of the sequelæ of trachoma is entropion of the eyelids with trichiasis. A simple removal of the misdirected eyelashes is only a temporary measure for if the hair follicle is not destroyed the condition recurs in the course of a few weeks. The hair follicles can be very easily destroyed by the galvanic needle cautery and in the case of extensive trichiasis a Webster's mucous graft operation should be carried out. The latter is a very simple operation and the result is very satisfactory.

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Before the discussion on the lids and conjunctiva is brought to a close, attention should be drawn to two other conditions, namely, acute inflammation and chronic blepharitis. In dealing with acute inflammation about the face and especially near the eye, the multiplicity of venous channels and the proximity of the cranial sinuses make any surgical interference an anxious process. Hence an extremely conservative attitude is usually necessary to allow the infection to localize in cases of acute styes,

infective chalazion, acute dacryocystitis and lid abscesses.

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Foreign body in the eye.—This is often a very deceptive ailment. A gritty sensation without any foreign body being present is felt when there is an ingrowing eyelash or loss of corneal epithelium. Corneal abrasions, epidemic superficial punctate keratitis, phlyctenular keratitis, dendritic ulcers or herpes of the cornea give rise to a gritty sensation on account of the irritation produced by every winking movement over the exposed nerve endings. A drop of 0.5 per cent alkaline fluorescein is all that is necessary to reveal the real nature of the complaint, as if there is a raw surface it stains bright green with this drug. In those cases in which the history is more definite, a careful search should be made in the fornices of the conjunctiva for the presence of a foreign body.

The removal of foreign bodies from the eye should always be done under a local anaesthetic and particular care should be taken in cases in which they have to be removed from the cornea, owing to the danger of a corneal opacity and, as a result, interference with vision. The abrasion left after removal of a foreign body from the cornea gives rise to a gritty sensation. This along with the presence of a corneal opacity gives the patient a false impression that the foreign body still remains. To obviate this, two important post-operative precautions should always be carried out :—

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cases and unless this tension is lowered by repeated paracentesis one cannot expect the ulcer to heal.

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(1) With advancing age the refractive index of the lens increases and more light is reflected back from its surface, thus giving the characteristic grey appearance which is seen in the pupils of old people. Unfortunately these cases are often diagnosed as cataract; this causes unnecessary anxiety to the patient as the lens may be absolutely normal.

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Glaucoma.—Acute glaucoma is a condition of surgical emergency and no time should be lost in carrying out treatment. The commonest type of glaucoma seen in India is the chronic simple primary type. It is a very insidious disease and its diagnosis is often one of extreme difficulty. There are three cardinal signs, increased intra-ocular tension, depression of the visual

point that should be stressed is the fact that eye affections are, in the majority of cases, secondary, that is, they are either a localized manifestation of some general disease or an extension from the neighbouring structures.

The lid and conjunctiva.—A patient comes to a doctor complaining of trouble in his eyes. On examination the doctor finds the skin of the eye is excoriated, eczematous and the conjunctiva red and discharging. The diagnosis is chronic conjunctivitis with secondary blepharitis and immediately the doctor rushes on and prescribes the usual treatment for these local conditions. If he were only a little more careful in his examination, he would probably find that the patient was suffering from a generalized affection of the skin, for instance impetigo, furunculosis or ringworm, or some such affection of the scalp and forehead as seborrhœa or acne rosacea. In these cases the eye is either being showered with micro-organisms, or infection is carried to the eye by infected fingers. Unless the skin condition is attended to, the eye will fail to improve with treatment or may even actually get worse.

Another common cause of chronic conjunctivitis and blepharitis especially of the angular type is an infected tear sac. Until this is removed, for there is really no other alternative way of dealing with an infected sac, the conjunctival condition will evade all treatment. Chronic conjunctivitis causing a great deal of discomfort in the eye with very few objective signs can often be traced to a patient's occupation requiring exposure of the eyes to dust, glare and irritants over a prolonged period. Times without number such cases have been diagnosed as trachoma or granular lids. The patient is given various kinds of treatment consisting mostly of applications of caustics and irritant drugs. A pair of protective goggles, a mild salve or lotion and a few drops of liquid paraffin daily are all that are required to cure the trouble.

Granules and follicles.—Much confusion centres around these two terms. Granules or follicles are collections of lymphoid tissue in the sub-epithelial layer of the conjunctiva. The presence of these without any symptoms is of absolutely no significance and requires no treatment. 'Granulosis' may be a localized manifestation of a general lymphoid hyperplasia and is physiologically present in young children in whom we also find a hyperplastic condition of similar tissues, namely spleen, thymus, tonsils and adenoids. The same condition is found in older children of a 'tuberculous diathesis'. Phlyctenulosis is a condition of the same group but with more serious ocular manifestations.

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fields and the presence of glaucomatous cupping. The measurement of tension requires a special instrument which is costly, extremely delicate, very easily gets out of order and requires expert handling. The fundi of the eyes show pathological changes in the way of glaucomatous cupping only when the disease is far advanced and even then it usually requires an expert to diagnose the changes in the optic discs.

The easiest method of making an early diagnosis of glaucoma is by mapping out the fields of vision. As the disease advances the fields show a progressive depression commencing first in one or both nasal quadrants, and the vertical depression of the blind spot. The central vision usually remains unaffected until the disease is very far advanced. The treatment for this type of glaucoma is always surgical and the best of the many operations for this disease in India is Elliot's sclero-corneal trephining.

One special variety of chronic simple glaucoma is common in Bengal and in the last year has occurred amongst Bengalis in the United Provinces, Bihar and Burma and is a symptom of epidemic dropsy. Epidemic dropsy is very commonly called *beri-beri* by the public but is an entirely different disease; it is due to a toxic cause and is not an avitaminosis. This epidemic dropsy gives rise to a temporary glaucoma without any signs of inflammation and, provided the fields of vision are normal, general treatment is all that is required; this consists of a complete stopping of rice as an article of diet, the administration of drugs such as ephedrine and if possible complete change of climate from the endemic area. The bowels should also be kept freely open. Local applications such as myotics to reduce tension are absolutely useless and should not be prescribed. Eserine is an irritant and sets up an inflammation and so makes operation more difficult should this be required later.

Strabismus or squint.—The general practitioner's knowledge of the causes of this condition is very meagre and this is the explanation why so few cases among Indians come to eye hospitals for early treatment. The following points should be borne in mind :—

(1) Concomitant convergent strabismus is the commonest variety of the condition.

(2) Unless the squinting eye is treated very early it becomes amblyopic, that is an eye with permanent partial sight.

(3) Errors of refraction are a common cause of the condition. If the eyes are examined under atropine as soon as the deformity is observed and the error of refraction fully corrected by glasses, the squint in most cases will be cured without operation.

(4) There is very little hope of regaining normal vision for a squinting eye if treatment is commenced when the child is older than six years. The affected eye can always be put

straight by a simple operation in the hands of an expert.

Dark-room examination.—This consists of the examination of the eye by oblique illumination and with the ophthalmoscope. The corneal loupe and the condensing lens are used for the detection of small opacities, ulcers, foreign bodies and keratitis precipitates of the cornea, also for minute changes in the iris and the lens. If a slit lamp and corneal microscope are available more minute changes in the cornea, iris, anterior chamber and lens can be detected. To examine the media, the pupils should be dilated with homatropine and the plane mirror of the ophthalmoscope should be used. Minute opacities in the media are usually seen by this method. If these opacities change their position when the eye is moved they must either be in the aqueous or in the vitreous; if stationary, they must be in the lens. By this method dislocation of the lens and retinal detachment can also be easily diagnosed. The ophthalmoscope is necessary to diagnose diseases of the retina and choroid.

Direct ophthalmoscopy.—To carry out this examination efficiently a mydriatic is required. The following points are worth observing when conducting this examination :—

(1) Direct ophthalmoscopy should never be carried out before first examining the eye by oblique illumination and with the plane mirror. This prevents unnecessary waste of time as it gives a bird's-eye view of the whole eye, as, if the media are not clear, it is useless to carry out direct ophthalmoscopy.

(2) The highest convex lens should always be in the sight hole to start with and the strength of the lens should be slowly wheeled down until the fundus is in focus. In this way all the structures from the cornea down to the fundus in turn come into focus and this prevents any structure from being overlooked. It has the further advantage of giving one an idea as to the depth of the object in focus and is extremely useful in the detection of retinal detachment, changes in the vitreous, intra-ocular tumours, papilloedema, glaucomatous cupping, etc. It also gives a fair idea of the refractive index of the eye.

(3) The ophthalmoscope should be brought as close to the eye of the patient as possible. Frequently cases are seen in which the media appeared to be clear but the fundus could not be seen. These are usually cases of high myopia and in inexperienced hands the fundi are better examined by indirect ophthalmoscopy.

(4) Examination of the periphery of the fundus should never be omitted as very often the earliest evidence of disease lies there, namely, retinitis pigmentosa, retinal detachment, etc. It is a good plan to examine the optic disc first of all, then the macula and lastly the periphery.

(Continued at foot of opposite page)

A-O TUBERCULIN IN OPHTHALMOLOGY

By B. P. BANAJI, F.R.C.S.I.

Bombay

TUBERCULIN therapy has come to stay in ophthalmological practice though general surgeons, as far as I am aware, are not at all enthusiastic about its therapeutic value in local surgical tuberculosis.

(Continued from previous page)

Refraction.—The work of refraction is intimately connected with mydriatics and retinoscopy. Without these, only simple presbyopic glasses should be prescribed. Up to the age of 16 years the best mydriatic is atropine and preferably should be prescribed as an ointment. For older patients homatropine is sufficient. Atropine should never be prescribed for patients over forty years of age because of the risk of glaucoma. Retinoscopy is very essential in cases of astigmatism and one should think twice before prescribing astigmatic glasses with the axis asymmetric. No age is too young to have glasses if there is an error of refraction. Young children and illiterate people who do not know the alphabet can have correct glasses prescribed with the help of an 'E' chart and retinoscopy by a refractionist.

Conclusion.—Success in the practice of ophthalmology is to a large extent a matter of careful attention to detail. Before operations, examination of the urine for albumin and sugar, the eradication of focal sepsis, and proper sterilization of the field are essential. In cases of operation on the eyeball, proper anaesthesia (conjunctival and retrobulbar ciliary blocking) and fascial akinesia guard against serious complications like escape of vitreous, etc. A small peripheral button-hole iridectomy (except in cases of patients with one eye where complete iridectomy is indicated) prevents prolapse of the iris after cataract operations. Careful examination of the pupil reactions, the determination of perception and projection of light and colour vision save the surgeon from operating in cases of cataract in which optic atrophy is present, and in which no vision can be restored.

The eye is a delicate organ and as such it should be handled with extreme gentleness and care. The mildest medicines, namely, normal saline lotion and boric lotions, liquid paraffin drops and boro-vaseline should as far as possible only be prescribed.

I am indebted to Lieut.-Col. E. W. O'G. Kirwan, Professor of Ophthalmology, Medical College, Calcutta, for his teaching, encouragement and for the inspiration he has given me to write this article.

The old tuberculin of Koch, long given up by physicians and general surgeons, has even now its advocates amongst ophthalmic surgeons though the introduction of Prof. Arima's A-O tuberculin ought to induce ophthalmologists to give up that dangerous therapeutic agent.

The A-O tuberculin appears to be the outcome of a most laborious search for a strain of tubercle bacillus which contains within its body more antibody-producing substances than tissue-destroying elements.

In 1931, I saw A-O tuberculin, a product of Japan, used both in Berlin and Vienna, the home of bacterial vaccines and that too in spite of its heavy cost. Since then I have used it in my practice, in some cases with remarkable results. I have no experience of its prophylactic use, but it is said that it could be administered to newborn babies without any harm.

Diagnostic value.—A-O tuberculin is also used for purpose of diagnosis. A blood smear for a leucocytic count is prepared and then 1 c.cm. of A-O tuberculin is injected.

Four more smears are made every half hour, half an hour after the injection of tuberculin. A leucocytic count is then made from all the five smears and a comparative chart is drawn with reference to the leucocytes in the original pre-injection collection.

In cases with a strongly positive reaction, there is a decrease of leucocytes (about 3,000) immediately after the injection and in the last collection the number has not returned to the original. In normal individuals there is very slight or no decrease in the number of leucocytes immediately after the injection; it tends rapidly to become normal or shows a tendency to increase.

As regards its administration for treatment, one ampoule of 1 c.cm. is given to adults once a week for twenty consecutive weeks. I have used it for the following tuberculous conditions:

Phlyctens, iritis, keratitis, recurrent retinal hæmorrhages in the young, choroiditis, and necrosis of the orbit.

I am not impressed with its value in recurrent phlyctens, specially those accompanied by severe blepharospasm. Most probably the ætiology of these cases comprises something more than tuberculous allergy. I strongly recommend its use in keratitis, iritis and hæmorrhages of the young. Of all the successful cases the most remarkable was that of a brother of a doctor who was suffering from relapsing keratitis, which had produced dense opacity of the cornea of one eye and an early affection of the other. In spite of all known treatment including new tuberculin (B. E.) the case was going from bad to worse. The use of A-O tuberculin ultimately cured the second eye and for the last year there has been no indication of a relapse.

RESPONSE TO PILOCARPINE IN CASES OF ASTHMA

By DHARMENDRA, M.B., B.S.

School of Tropical Medicine, Calcutta

PILOCARPINE stimulates the vagus nerve endings, the secretory nerves, and the nerve endings governing the involuntary muscles. Its action is thus directly antagonistic to atropine. By stimulating the vagal nerve endings in the bronchi it increases the bronchiolar contraction and the breathing may become laboured. By stimulating the secretory nerve endings it produces a copious secretion of saliva, flushing of the face and neck followed by profuse sweating, and running from the eyes and the nose. By stimulating the nerve endings governing the involuntary muscles it causes increased peristaltic movements of the unstriated muscles of the gastro-intestinal tract and may cause nausea, vomiting, colicky pains and diarrhoea.

The pharmacopoeial dose of pilocarpine nitrate is gr. 1/5 to 1/20; generally a dose of gr. 1/6 is used and in this dose it produces the reactions in a normal individual. Alexander and Padlock (1921) have observed that in doses of 1/20 gr. it produces very scant or no response in normal individuals whereas the same dose elicits varying degrees of reaction in vagotonic individuals. Using this dose they found an abnormally increased sensitiveness to pilocarpine amongst asthmatics.

We tested the pilocarpine response in 47 cases of asthma and in 11 non-asthmatics who served as control. In the case of asthmatics the test was done during an interval of freedom from the attacks. A hypodermic injection of gr. 1/20 of pilocarpine nitrate was used and the symptoms looked for after the injection included increased salivation, increased perspiration, flushing of the face, a feeling of warmth and running from the eyes and nose, etc.

Amongst the 11 controls none showed any marked reaction, 2 reacted slightly with increased salivation, and a feeling of warmth, 8 reacted very slightly with increased salivation and there was no reaction in one case.

Amongst the 47 asthmatics there was marked reaction in 30 cases, slight reaction in 12 cases and no reaction in 5 cases (table I). In the

TABLE I

Type of cases	Number of cases	RESPONSE TO GR. 1/20 OF PILOCARPINE NITRATE		
		Marked	Slight	Very slight or negative
Asthma	47	30	12	5
Control	11	..	2	9

30 cases reacting markedly the response consisted in a great increase in salivation and

perspiration, flushing of the face and a feeling of warmth. In addition there was some shaking and trembling of the limbs in 4 cases, slight running from the nose in 2 cases, headache and vomiting in one case, headache in 2 cases, palpitation of the heart in one case, and one patient complained of feeling sleepy. In three of the cases the test was followed by increased cough and one patient had an attack during the following night. Increased perspiration and salivation began in about 10 minutes and lasted for about half an hour or longer; the other symptoms lasted for a much shorter period. In the cases reacting only slightly, there was slight salivation or slight perspiration or both, and the symptoms lasted for about 10 minutes or so.

Amongst the 47 cases of asthma, the symptoms in 36 cases were dependent on some pathological change in the respiratory tract (bronchial cases) and the remaining 11 were of the allergic type.

An analysis of the pilocarpine test according to this grouping is shown in table II. It will

TABLE II

Type of cases	Number of cases	RESPONSE TO PILOCARPINE		
		Marked	Slight	Negative
Bronchial	36	28	8	..
Allergic ..	11	2	4	5
TOTAL ..	47	30	12	5

be seen that out of the 36 bronchial cases there was marked reaction in 28 and slight reaction in 8 cases. Amongst the 11 allergic cases the reaction was marked in 2, slight in 4, and negative in 5 cases. This shows that the bronchial cases are extremely sensitive to pilocarpine while the allergic ones are comparatively less so. In other words there is marked vagotonia in the bronchial cases while the allergic ones are not necessarily vagotonic.

I will refer here to another clinical observation. In the patients reacting markedly to the pilocarpine test the attack was relieved by a hypodermic injection of gr. 1/150 of atropine sulphate and the relief was usually more marked than by an injection of adrenaline. (Atropine acts by paralysing the vagal nerve endings.) In the patients reacting only slightly to the pilocarpine test the attacks were relieved by an injection of 0.5 c.c. of a 1 in 1,000 solution of adrenaline chloride and the atropine injection had only slight or no effect at all. In 6 of the 47 cases we had an opportunity of studying the effects of both atropine and adrenaline on the asthmatic attacks.

The pilocarpine response and the therapeutic effects of atropine and adrenaline in these cases

TABLE III

Serial number	Type of cases	RESPONSE TO GR. 1/20 PILOCARPINE NITRATE				EFFECT ON THE ATTACK	
		Flushing	Sweating	Salivation	Other symptoms	Hypodermic injection of 0.5 c.c. adrenaline chloride	Hypodermic injection gr. 1/150 atropine sulphate
1	Bronchial	+	+	+	Trembling	Not relieved	Relieved.
2	Bronchial	++	++	++	Feeling sleepy	Relieved	Relieved.
3	Mixed	—	—	Slight	Slight running from nose.	Relieved	Relieved.
4	Bronchial	—	+	—	Headache	Relieved	Partial relief.
5	Bronchial	+	++	++	Asthmatic attack during the following night.	Partial relief	Relieved.
6	Allergic	—	—	+	....	Relieved	Not relieved.

are shown in table III. It will be seen that the pilocarpine response was marked in three cases and only slight in the other three. Asthmatic attacks in all the 3 cases reacting markedly to pilocarpine were relieved by atropine injection, while adrenaline gave relief in one case, only partial relief in the second and no relief in the third case. On the other hand the attacks in all 3 cases reacting only slightly to pilocarpine were relieved by adrenaline while atropine gave relief in only one of these cases, partial relief in the second and no relief in the third case.

Summary

(1) The response to an injection of gr. 1/20 pilocarpine nitrate was tested in 47 asthmatics and 11 non-asthmatics.

(2) Amongst the asthmatics, there was marked reaction in 30 cases, slight reaction in 12 cases, and no reaction in 5 cases. Amongst the controls, 2 reacted slightly and 9 very slightly or not at all. This shows an increased susceptibility to pilocarpine in asthmatics.

(3) This increased susceptibility to pilocarpine is more marked in cases of asthma dependent on some pathological condition in the respiratory tract, i.e., bronchial cases, than in the allergic cases.

(4) The attacks in the cases reacting markedly to pilocarpine are relieved by a hypodermic injection of gr. 1/150 of atropine sulphate. In the cases reacting only slightly to pilocarpine the attacks are relieved by an injection of adrenaline.

For permission to publish this note, my thanks are due to Dr. L. Everard Napier, under whose charge the patients referred to were being treated and in whose department I am working.

REFERENCE

Alexander, H. L., and Paddock, R. (1921). *Arch. Int. Med.*, Vol. XXVII, p. 184.

THE SO-CALLED MYSTERY DISEASE OF CALCUTTA (*JHIN-JHINIA* OR *THAR-THARIA*)

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WHEN the epidemic of epidemic dropsy was over last year, there broke out the so-called 'mystery disease' in the vicinity of Calcutta. It was first reported in a Bengali daily paper and subsequently the District Health Officer of 24-Parganas came and saw us and reported that this unknown disease had been prevalent in Hashnabad thana in Basirhat subdivision about 40 miles from Calcutta. He had not seen any case himself, but he gave a description of what he had heard and asked for instructions in the matter. About the middle of November 1935, a field party was sent by the senior author to this place to carry out a preliminary investigation.

Information collected showed that the 'disease' started suddenly in the latter part of September 1935 at Bolbule and Katakhal villages on the right bank of the Ichamati river. Next the other villages were said to be affected, one after another along this river and it was foretold at that time that it would soon reach Calcutta. When a village was affected, a number of villagers were said to fall victims to it. The average duration of the 'disease' in one particular village was about a week after which only stray cases might be found. The 'disease' usually attacked persons in the evening after 4 p.m. though there were some cases with morning attacks. It was said that about 40 to 50 inhabitants of a village were attacked in one night. It was first confined mostly to the Mohammedan females but later the male sex and the Hindus were also affected. The majority were between the ages of 18 and 35 years,

though it was said that a child of 3 years and a man of 60 years suffered from it. The majority had only one attack; these were a few who were said to have had more than one attack. Enquiries from 20 affected villages showed that there was no authenticated case of death due to this condition.

The 'disease' is said usually to start suddenly with a tingling sensation in one or both feet, especially the big toes. The sensation then spreads up along the body to the head. Many patients are said to complain also of headache, giddiness and hot burning sensation in the head. Simultaneously with or soon after this subjective sensation, the victim begins to shiver and may have severe movements of the whole body. The eyes are said to be intensely congested and the body stiff during an attack. Symptoms vary in severity; they may be mild or severe; consciousness is as a rule retained. The attack lasts from a few minutes to a few hours. According to the belief commonly held by the villagers, this 'disease' causes the blood to rush from the feet up to the head. The diminished blood in the feet causes the initial tingling and the excessive blood in the head gives rise to hot burning sensation, dizziness, muscular movements and congestion of eyes. They call it *jhin-jhinia* because of this tingling sensation and *thartharia* because of the shivering.

Their method of treatment is based on this view and is somewhat inhuman. The patient is not allowed to lie down, as further rush of blood to the brain may be fatal! He is therefore tied to a post or tree or held up in an erect posture. Cold water is poured on the head continuously so that the blood may go back to the legs, congestion of the brain be relieved and the life may thereby be saved! This practice is carried on for hours together or till the patient feels too cold and asks for it to be stopped. Sometimes several hundred pitcherfuls or bucketfuls of water are poured on the head, and this procedure in this cold season must not only be very trying but a source of danger. This method, it is said, was first started by a village school master, when one of his students fainted in the school and this novel practice has since then been widely adopted. At times water is poured as soon as any tingling is complained of just to avert the attack. Tying the big toe with thread is said to have been an effective prophylactic measure in many cases! Cauliflowers and brinjals have often been incriminated as causative factors and many have stopped eating them through fear.

At Hashnabad and near by about nine cases only were seen of which seven were examined after their attacks were over and two while the attack was in progress, in fact when water was being poured on them.

Case I.—Patient, K. P.'s wife, Hindu, female, aged 18 years. In the evening of 14th November, 1935, she felt giddy, palpitation and tingling about the toes and

heels; this was followed by the 'shaking' of the whole body. Water was poured on her from 7 to 10 p.m. when she had a very severe rigor and was taken to bed. She could not sleep the whole night and her eyes were congested. She had also milder attacks on the following two evenings.

Physical examination done on 17th November, 1935, revealed no abnormality except slight pallor and increased knee-jerks. Her pulse was 70 and respiration 20 per minute. Blood pressure was 120/80 mm. of Hg. There was a history of hysterical fits for some years.

Case II.—Patient, R. B., Mohammedan, male, aged 26 years. On 13th November, 1935, at about 6 p.m. he felt a tingling sensation about the right shin bone followed by vertigo and a hot sensation in the head. Then there was the 'shaking' of the whole body till 10 p.m. His eyes turned red. He was relieved by sweet drinks and pouring of water.

Physical examination on 17th November, 1935, showed no abnormality except increased knee-jerks and a palpable spleen. Pulse was 74 and respiration 24 per minute. Blood pressure was 118/86 mm. mercury.

Case III.—Patient, J. A. S.'s wife, Mohammedan female, aged 20 years. On 15th November, 1935, at 1 a.m. she had a cramp in the right leg for about 10 minutes. Then she became very stiff but had no shivering. Water was poured on her and she recovered soon after it. On the 16th evening she complained of dryness of throat and groaned for a while, but the attack passed off itself. On the 17th morning she complained of tingling in the legs passing up to the head. Her eyes turned red and she was said to be 'unconscious' for some time. Recovery followed the usual treatment of pouring cold water on the head.

Physical examination done on 17th November, 1935, revealed no abnormality except enlargement of the spleen down to the umbilicus. Pulse was 76 and respiration 22 per minute. Blood pressure was 108/75 mm. of Hg. Knee-jerks were normal.

Case IV.—Patient, T. B.'s wife, Hindu, female, aged 32 years. On 15th November, 1935, while carrying a pitcherful of water she felt as if her left foot was cracked and her body started shaking. She went to the next house, where the people poured water on her and controlled the attack. She was conscious all the time and her eyes did not turn red. Same night she had another attack, which was again cured by pouring water.

She suffers from chronic cough and gave a history of hæmoptysis. Physical examination showed enlargement of the liver and crepitations at the apex of the left lung.

Case V.—Patient, late A. B.'s wife, Hindu, female, aged 35 years. On 16th November, 1935, while washing utensils in a tank she suddenly got tingling sensation in the right leg, which gradually spread up to the right shoulder and back of the neck. This was followed by throbbing sensation in the head and a feeling of constriction about the heart. Then her body started shaking. She was said to be quite conscious, but could not speak. The attack was controlled by water treatment.

There was history of hysterical fits in this patient. No abnormality was detected on physical examination. Pulse was 64 and respiration 24 p.m. Blood pressure was 134/84 mm. of Hg.

Case VI.—Patient, M. S.'s wife, Mohammedan, female, aged 30 years. On the 14th and 15th November, she had high fever with rigor. On the 16th in the evening she felt giddy and a tingling sensation in the left leg which was followed by shaking of the whole body. Water was poured on her for about an hour when she recovered.

Physical examination—Patient looked weak and ill. Eyes were normal. Heart sounds were weak. Pulse was 92 and respiration 28 per minute. Blood pressure was 120/85 mm. of Hg.

Case VII.—B., Hindu, female, aged 12 years. On the 17th afternoon she complained of pain in the orbits and felt as if her head was bursting. She complained

of tingling of the feet, had a rigor and vomited twice. Water was poured on her for about three-quarters of an hour, when our party arrived. She was conscious. There was no congestion of the eyes. 'Shaking' of the body was a mere shivering due to cold. Her clothes were changed and she was put to bed with quilts on in spite of the protest by her people that she would be worse or even die if laid down. Nothing untoward happened, rather the patient felt better.

Physical examination showed enlargement of the spleen 1½ inches below the costal margin. Other systems were normal. Temperature was subnormal, pulse 104 and respiration 30 per minute. Blood pressure was 106/70 mm. of Hg. (malignant tertian malarial parasite rings were found in the blood).

Case VIII.—Patient, M. A., Mohammedan, female, aged 30 years. There was the usual history of tingling followed by trembling. She was seen while water was being poured on her at about 8 p.m. She was shivering with cold, the field party stopped it, put her to bed and she felt comfortable. Her spleen was enlarged. No other abnormality was detected.

Case IX.—A Mohammedan, female, aged 18 years. She gave a history of a mild attack on 15th November, 1935. She stated that she had an attack of palpitation and tingling of the feet, but quick administration of water on the head aborted the attack! Excepting slight tachycardia nothing abnormal was detected.

Later, intimation was brought from the Director of Public Health that cases were reported from Khulna and Jessore also and that there were no deaths. The District Health Officer, Alipur, wrote on the 4th December, 1935, reporting an outbreak in a virulent form in Barasat and its vicinity. The place was visited by the field party on the 8th December, but hardly any case could be seen. According to the version of the subdivisional officer, the officer in charge of the thana and the sub-assistant surgeon in charge of the dispensary, there were only two cases in Barasat—one in the court and another in the 'hat'.

Case X.—In an adjacent village, Hridaypur, a boy, Hindu, male, aged 20 years, was examined. He had an attack a few days ago and his father stated that there was a good deal of discussion about the 'disease' in his house following the case occurring in the 'hat'. At about 10 p.m. he complained of hot sensation inside the head and could not move, but he was quite conscious; water was poured on him and within ten minutes he was all right. Physical examination showed diminished knee-jerks and palpable spleen.

Panicky topics were being extensively discussed in public places like the court, 'hat', etc. The field party was informed that in some places towards Basirhat, the villagers have been warned by the beating of drums not to go alone especially after sunset or at least three persons should go together and carry a pitcher with them for safety sake.

Case XI.—Hindu, boy of a respectable family, aged 14 years, was brought from Basirhat to the School of Tropical Medicine for examination. He had an attack in his school and was cured by water treatment. No abnormality was detected in him. We were subsequently informed that he had another attack of a mild type afterwards.

As prophesied, subsequently a number of cases occurred in Calcutta and six cases were admitted into the Carmichael Hospital for Tropical Diseases.

Case XII.—S. H., a Hindu, male, aged about 35 years, a mechanic, came from his village 'Gore', about nine miles from Sealdah to the workshop in Calcutta

on 20th December, 1935. After working for 10 minutes he felt a severe tingling sensation in the right toe followed by aching of the whole of the right leg. This lasted for about three minutes when he started shivering. There was a 'shaking' of the whole body for about 2 minutes. Next, he felt as if his whole body was paralysed and he could not move. It was said that at this time he lost consciousness, his eyes turned very red and his body was very hot to the touch. He was held up by two men and water was poured on his head by buckets. After about 12 buckets of water were poured on his head he became conscious and felt very chilly. Subsequently more water (altogether about 30 buckets) was poured and ice applied on the head and nape of neck. He was then brought to the Carmichael Hospital for Tropical Diseases.

He stated that his niece, a girl of 18 years, had an attack the night before last (18th December, 1935). There was no other case in the same village. He had also heard of a death in an adjacent village about a week ago; it was rumoured that the victim's eyes burst leading to hæmorrhage and death! In another case, he heard that the skull of a man exploded during an attack while he was working in the field!

Physical examination.—Decubitus—patient lying down having rigor—fully conscious. Eyes slightly congested. Pupils equal, normal size, reacting to light and accommodation. Vision clear. Ears—hearing normal. Nose—sensation of smell unaffected. Tonsils enlarged. Teeth and gums—pyorrhœa present. Tongue clean and moist. No tremor. Neck—no stiffness. No enlargements of glands. Triceps—jerks increased. Knee-jerks increased. Patellar clonus—nil. Ankle clonus—nil. Babinski's sign—nil. Abdominal reflex—present. Kernig's sign—absent. Gait—normal. Sensation—impaired (?) on the right leg. Heart—apex normal site, sounds—normal. Pulse regular—90 per minute. Blood pressure S/D—132/95 mm. of Hg. Lungs—normal. Respiration—26 per minute. Liver and spleen not enlarged. Extremities cold. Temperature—97°F. Lumbar puncture—25 c.c. clear fluid was drawn under pressure. Complete examination of the blood, urine and stools showed no abnormality except hookworm infection.

Cerebro-spinal fluid showed no cells except a few red blood corpuscles. Culture was sterile. Wassermann reaction was negative. Sugar content was 0.071 per cent and urea content—0.015 per cent. Globulin test was negative.

Case XIII.—A. R., a Mohammedan, male, aged 45 years, a tramway conductor, was admitted into the Carmichael Hospital for Tropical Diseases on the 26th December, 1935. He was on duty in a second class compartment of a tram car on the Chitpore line, when at about 10 a.m. he felt a tingling sensation on the right side of the head followed by giddiness and dim vision. He informed the conductor of the first class compartment about it, who at once stopped the car and had him taken out. He was held by several men and about fifty buckets of cold water were poured on his head. One of the members of the staff of the School happened to be passing by and saw the man shivering with cold and begging the people not to pour any more water. This was stopped and the patient was brought to the hospital.

Condition on admission.—Patient was shivering, undoubtedly due to cold. His body and extremities were cold. Temperature was 96°F., pulse 96, and respiration 28 per minute. He was fully conscious and had no complaint excepting shivering with cold. He was immediately put to bed and warmed up with blankets and hot water bottle and given hot milk. Within a short time he felt all right excepting slight pain in the left thigh.

Physical examination showed no abnormality except pyorrhœa alveolaris and some carious teeth. His blood pressure was—S/D—150/100 mm. of Hg. Lumbar puncture was done—18 c.c. of clear fluid was drawn off under pressure. The fluid was clear and contained no cells except a few red cells. Culture was

sterile. Globulin test was negative. Urine showed no abnormality. *Ascaris* ova were found in the stools. Further laboratory examinations showed no abnormality.

Case XIV.—A weaver in the Albion Jute Mills, Budge Budge, aged 50 years, was admitted on the 6th January, 1936.

Early in the morning, as he was waiting for the mill gate to open with other employes, he heard discussions regarding *jhin-jhinia* disease and of many deaths due to this disease.

He was perfectly fit when he started to his work. After about half an hour he felt giddy and a burning sensation all over the body. He also felt a little tingling about the right big toe. He put some water on his head himself. Then felt tingling in both feet again, and began to shiver; the other workers then poured cold water on his head. Next he was removed to the dispensary attached to the mill, where he was laid down and ice was applied on the head and spine. The doctor brought him to the Carmichael Hospital for Tropical Diseases for admission, under the instruction of Lieutenant-Colonel Denham White.

On admission, the patient's temperature was 98°, pulse 80 and respiration 20. He was shivering with cold. There was no congestion of the eyes. Excepting slight exaggeration of the knee-jerks and triceps jerks no abnormality was discovered. Blood pressure was systolic 130 and diastolic 90 mm. of Hg. Wassermann reaction was negative. Culture and other tests showed negative results. Stools showed hookworm ova, *Giardia* cysts, pus cells, and *Streptococcus faecalis*. Urine was normal.

Case XV.—P. J., a fireman, Tala Water Works, aged 40 years, U. P. man, Hindu, was admitted on the 8th January, 1936, at 1 p.m.

He had pain and tingling sensation in the great toe of right foot last evening but nothing happened during the night. The following morning, after having his breakfast he had a similar tingling sensation. He complained of it to other workers, who poured cold water on his head and body (about 10 buckets). A local doctor stopped it and sent him to the hospital.

Condition on admission—The patient was shivering, apparently due to cold. Body was cold and wet. Temperature was subnormal; pulse 96 and respiration 26. Eyes were normal. Knee-jerks were brisk on both sides. Other reflexes were normal. Blood pressure was 140/100 mm. of Hg.

Lumbar puncture—The cerebro-spinal fluid was clear. About 15 c.c. was removed, pressure normal. There were hardly any cells in it. Culture was sterile.

Sugar—0.064 per cent and chloride—0.713 per cent.

Urine was normal.

Globulin test was negative.

(Note.—This patient had 12 fingers and 12 toes.)

Case XVI.—A. K., a Mohammedan duftry, aged 28 years, was admitted on the 9th January, 1936, at 1-30 p.m. While he was working in a sitting position in his office at about 12 noon, he suddenly felt a tingling sensation in both his feet—which went up to his legs and thighs. Thinking that he had got *jhin-jhinia* he was taken under a tap and kept there for some time. Besides 5 seers of ice were applied on the head and spine. Then he was brought to the hospital. On admission he was found to be suffering from the effects of treatment. Physical examination did not reveal any abnormality. Knee-jerks were normal. Excepting eosinophilia of 10 per cent there was nothing particular in the laboratory findings.

Case XVII.—A. A., a Mohammedan male, an inkman of a printing press at Shibpore, was admitted on 10th January, 1936, at 12-30 p.m.

While attending his duty, he felt a tingling in his toes spreading up to the thigh. He was said to have dropped down unconscious. Water was poured on him when he became conscious.

On admission the patient was cold and clammy and shivering with cold.

Temperature was 96°F., pulse 72 and respiration 18 per minute. Eyes were normal. Excepting slight exaggeration of deep reflexes, there were no abnormal clinical findings.

On lumbar puncture clear cerebro-spinal fluid was drawn with normal pressure. Hookworm ova in the stools were the only positive laboratory findings.

Blood counts were done in all the above cases; excepting slight eosinophilia, in some cases which is apparently due to associated conditions, the results were normal. Tissue culture carried on with the plasma and cerebro-spinal fluid of the cases treated in the hospital showed no change.

Discussion

A perusal of the above records would show that the features commonly met with in this 'disease' are mostly subjective sensations, *viz.*, tingling, cramps, hot burning sensation, etc., followed by a shivering of the body. They are of short duration, and physical examination of the patients revealed minor abnormalities only. These would be found even if a series of persons not suffering from the disease were examined. The only ones of some interest are a tendency to exaggeration of knee-jerks and increase in the pressure of cerebro-spinal fluid in certain cases. The latter, though of more importance than the former, can occur in various conditions, *viz.*, paroxysmal cough, severe exertion, prolonged crying, etc. The effect of severe chill and exertion as a result of the water treatment can account for the increase of pressure of the cerebro-spinal fluid.

Undoubtedly there has been a panic prevailing among the people. There is practically no evidence to show that the disease is any organic disease syndrome recognized in scientific medicine. The majority of the cases of this so-called disease seen in the hospitals in Calcutta have been either cases of some definite diagnosable organic disease, such as epilepsy, apoplexy, malaria, poisoning, or have been apparently normal individuals suffering from the effects of treatment for this so-called disease, that they have received outside. When they had recovered from the effects of treatment they had no more subjective symptoms and were quite fit to be discharged from the hospital. All these patients had heard about *jhin-jhinia*, had discussed it with their companions, and knew the symptoms that were supposed to be associated with this so-called disease. It is impossible to escape the conclusion that in the cases investigated by us the affection was of a purely functional nature. Even in the severest form it produced no mortality and the symptoms were of short duration. There is no justification for the panic and the drastic treatment adopted by the people is not only wrong but harmful.

Absence of any definite neurological signs rule out encephalitis. It was suggested by certain health authorities that the condition might be acute lymphocytic choreomeningitis as reported in America. The main feature of the

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TECHNIQUE FOR PUTTING UP FRACTURE OF THE CLAVICLE

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ALL the best-known methods of splinting a fractured clavicle are imperfect in their application, except perhaps Bohler's method which I have not tried, because it needs special apparatus and looks complicated and cumbersome.

Sayre's method allows the shoulder to drop and does not properly control the outer fragment. When much leverage on the first turn of strapping on the arm is necessary to reduce the overlapping of the fragments and maintain reduction the arm becomes very swollen and the skin abraded, and very often the patient cannot tolerate the appliance.

The clavicular cross is cumbersome and the lower end where it impinges on the sacrum tends to slip downwards and to carry the

(Continued from previous page)

latter condition is that of an infection of the upper respiratory tract followed by meningeal symptoms which are ushered in by sudden onset with headache, nausea or vomiting, rise in temperature to 100° to 103°F., stiff neck and a positive Kernig's sign. The disease runs a benign course for about 10 days to 2 weeks. The temperature declines by lysis. The cerebrospinal fluid is under increased pressure; its cells are considerably increased. This cellular response is almost entirely lymphocytic. A comparative study of the two conditions will convince any impartial observer that they are not the same.

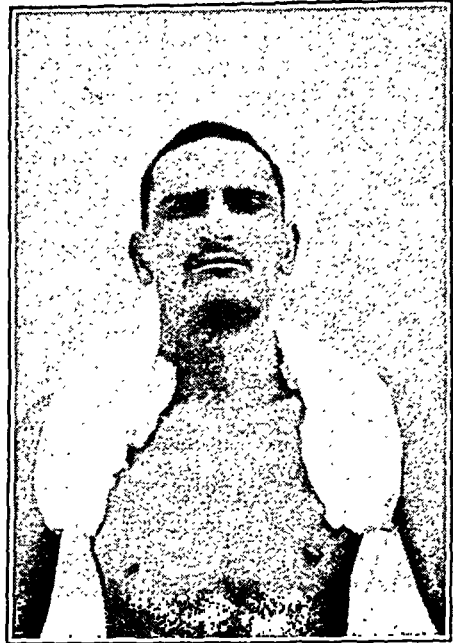
Conclusions

From the cases of the so-called mystery disease, *jhin-jhinia*, we have recently studied, we have formed the opinion that it is very doubtful if it is a disease entity at all. There was a panic prevailing among the people and any of the ordinary diseases such as malaria, epilepsy, hysteria, neurosis, apoplexy and the like were diagnosed as the so-called mystery disease. The panic was intensified by articles in the press and by different forms of treatment which were extensively advertised.

In this connection we would like to draw attention to the fact that a mystery disease called *makawlen* appeared in Burma eight or nine years ago and the Government went so far as to appoint a committee to investigate the condition. The conclusions of this committee were that *makawlen* was more of interest to the psychologist than to the pathologist; it actually turned out to be nothing but malaria and the eruptions around the anus which were supposed to accompany the disease were never seen by any medical man.

shoulders with it, and the ideal upward and backward position of the shoulders is lost.

In Desault's method, with a wedge in the axilla, the vessels and nerves tend to be seriously pressed upon, and as in Sayre's method the



shoulder joint is fixed and tends to become stiff, at least temporarily.

Treatment in bed with a sand-bag or pillow between the shoulders or by extension on the abducted arm are both unnecessarily exacting experiences.



In a limited series of cases in Quetta it has been found both simple, expeditious and extremely effective to put these cases up in a figure-of-eight plaster bandage passing between the shoulders posteriorly and drawing them well back. When pain prevents the assumption

of a satisfactory position before applying the bandage the fracture can be injected with 2 per cent novocaine.

It is important to apply the plaster as a prepared soft splint which can be moulded into position, and not as a roller bandage, as the latter rolls up into a ropy mass in the axillæ. This cuts into the tissues, does not keep the shoulders back so well, and the technique is not so simple. A thoroughly wet strip 6 feet by 3 inches and about 12 layers thick is made by unrolling backwards and forwards and rubbing the plaster in.



The axillæ and shoulders are very well padded with cotton-wool and with the shoulders held well back and upward by the patient and an assistant, the plaster splint is applied as a figure of eight between the shoulders with a little tension. It is moulded well into the curves of the part except actually in the axillæ where the plaster is not allowed to roll up. This latter procedure keeps the arm held a little way from the side, which position is a distinct aid in maintaining the upward and backward position of the shoulders. Finally a few turns of a plaster bandage over the shoulder where the plaster splint terminates, fixes the free end.

When the plaster has hardened it not only keeps the shoulders immovably fixed in a backward position without any fear of bandage slipping or stretching, but the rigidity of the plaster and the broad bulky mass in the axillæ does in actual fact preserve a perfect elevation of the shoulders.

(Continued at foot of next column)

NATURAL *SPIRILLUM MINUS* INFECTION IN WHITE MICE

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THE following incident may serve as a warning to other laboratory workers in India engaged in the study of rat-bite fever.

J. H. C., an Anglo-Indian male, resident in Calcutta, aged 28 years, was admitted to the Carmichael Hospital for Tropical Diseases on the 25th October, 1935, suffering from daily intermittent fever, rising to 103°F. or even higher, with rigors and vague pain in the left lumbar region. The fever had persisted for approximately one year before the patient's admission to hospital. Every possible clinical and laboratory examination was carried out, but no diagnosis could be made.

The patient keeps a tame squirrel, and it seemed possible that this squirrel might have become infected with *Spirillum minus*—the organism of rat-bite fever, which is known to infect rodents other than the rat—and have conveyed the infection to the patient. (There was no history of a rat bite at all.)

Accordingly, on the 28th November, the patient's blood was inoculated intraperitoneally into a white mouse (*Mus leucopus*). On the 7th December the blood of this mouse showed *Spirillum minus*—a moderately heavy infection. The diagnosis now appeared to be clear; rat-bite fever, probably contracted from a bite by the tame squirrel.

Two intravenous injections of novarsenobillon were next given, but the fever still persisted at its original level. Accordingly, at different intervals of time five other white mice were inoculated with the patient's blood. To our great surprise every one of these five mice later showed *Spirillum minus* infection.

(Continued from previous column)

It is not necessary to apply a sling, as the patient, for his own comfort's sake, rests his hands on his hips, or on the knees while sitting or squatting.

This form of fixation leaves the arms free and there is no loss of function at the shoulder joint.

In contrast to other methods of splinting this method is simple, needs no apparatus, keeps the shoulders well up and back without any chance of moving, preserves the alignment of the fragments, and leaves the arm free for active movements.

We were now faced with three possibilities, viz :—

(i) Was the batch of novarsenobillon used inactive? This appeared to be unlikely; as it had been issued by the Medical Storekeeper to Government with the usual certificate.

(ii) Was the strain of *Spirillum minus* an arsenic-resistant one? We had never read or heard of such a strain, but it seemed not impossible.

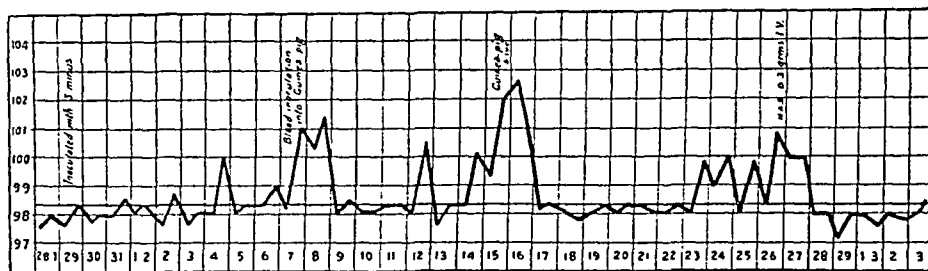
(iii) Were the white mice concerned already naturally infected with *Spirillum minus*?

being naturally infected, and used young guinea-pigs as control animals.

We next decided to test the pathogenicity of this mouse strain. Having obtained an adult male Hindu volunteer, he was put to bed in the hospital and carefully examined. He gave no history of rat bite, and showed no cutaneous lesions. His temperature was normal, and examination of his blood under the darkground and in thin and thick films showed no parasites.

The next day—29th January, 1936—the tail of a white mouse showing natural infection with

CHART



Mouse strain of *Spirillum minus*. Temperature chart of human volunteer.

We decided to test the third possibility first. The white mice concerned were part of a batch of 100 received some months previously from the Central Research Institute, Kasauli. On receipt at the School the white mice had been caged in fours in capacious cages of narrow meshed galvanized iron netting—five meshes to the inch. No rat could possibly have got at the mice under these circumstances to bite them.

There were 31 mice of this batch left in the animal house; these had received no inoculation of any sort, and had not been used for any experimental purpose. The blood of each of these 31 mice was now examined twice, on each occasion under the darkground illumination and in thin stained blood films. To our surprise we found that at the first examination no less than 14 showed natural infection with *Spirillum minus*, whilst the second examination showed a fifteenth mouse also infected. In other words no less than 48 per cent of this batch of white mice showed a natural infection with *Spirillum minus*; a state of affairs which, from our knowledge of the literature, we believe to be without precedent.

On looking through the literature we found that Robertson (1930) recorded that he had found four white mice naturally infected since 1924. (The number of white mice examined is not recorded, but was presumably large, since Professor Robertson has been working on rat-bite fever for several years). Das Gupta and Chatterjee (1933), in describing previously undetected *Spirillum minus* infection in the nasal secretion of patients with anæsthetic leprosy, drew attention to the possibility of white mice



Spirillum minus was cleaned with absolute alcohol and then thoroughly washed with sterile saline to remove all traces of alcohol. The end of the tail was then snipped off with a pair of

fine scissors. A few drops of blood were collected on a sterile watch glass, diluted with a little sterile saline, the whole aspirated into a sterile hypodermic syringe and inoculated intradermally into the right arm of the human volunteer.

On the sixth day after this inoculation the patient showed a temperature of 100°F. After this he ran a typical rat-bite fever course with five or six relapses, as shown in the temperature chart.

On the seventh day after inoculation the skin around the site of inoculation became red, painful and œdematous—the appearances being as shown in the photograph. The axillary glands draining the site of the lesion also became enlarged and tender.

No spirilla could be detected in the serous exudate from the site of the inoculation. On the ninth day after the inoculation, however, blood was taken from the patient at the height of the febrile phase and inoculated intraperitoneally into a young guinea-pig—whose blood had twice previously been examined with negative results. This guinea-pig showed *Spirillum minus* in its peritoneal fluid eight days later, and in its blood on the eleventh day.

This mouse strain of *Spirillum minus* was thus proved to be pathogenic to man. Twenty-eight days after inoculation, and during an acute febrile relapse, the patient was treated

with novarsenobillon intravenously and made a rapid recovery.

From this experience it is quite clear that the white mouse may not be a reliable animal for blood injection in the test for *Spirillum minus* infection. We have now commenced searching the blood of young guinea-pigs, both under the darkground, and in stained blood films, and have found no infection in the first 20 so far examined.

Summary

Fifteen out of 31 white mice—or 48 per cent—were found to be suffering from natural infection with *Spirillum minus*, and it has been demonstrated that this mouse strain is pathogenic to man. It thus becomes evident that the white mouse may not be a reliable animal for blood inoculation in testing for rat-bite fever.

Our special thanks are due to Bt.-Colonel R. N. Chopra, C.I.E., K.H.P., I.M.S., Director of the School, and to our colleagues on the staff for permission to use the notes on the case.

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A Mirror of Hospital Practice

A PECULIAR COMPLICATION OF LABOUR*

By A. S. GILL, L.M.P.

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ON the 11th December, 1934, I was called to see a confinement which was being attended to by a competent midwife. The patient was a 25 years Burmese woman of rather a delicate constitution, second para, normal previous labour with a healthy child and without history of any abortion or miscarriage. She had been in labour for the previous 18 hours. The midwife informed me that the os was fully dilated but that the head would not descend. At the same time she pointed to an irregular bulging of the uterus towards the right costal margin. The general condition of the patient was quite satisfactory, pulse—92, respiration—24, temperature—normal, pains weak and infrequent.

Abdominal palpation showed the uterus to be out of tone, irregular and with a bulging curvature of the

upper right quadrant. Vaginal examination showed a fully-dilated os, head fixed in L. O. A. position, and no apparent disproportion between the head and the passages. The bulging was very puzzling. A more extensive palpation, percussion and auscultation brought out the fact that it was the liver adhering to the uterus and had followed it downwards right out of the hypochondrium and its upper surface could be palpated easily. The normal liver area was partly occupied above by the lung resonance; this situation caused anxiety on account of the possibility of post-partum hæmorrhage. There was no history suggesting a diagnosis of old peritonitis.

Half a cubic centimetre of pituitrin was injected. It was immediately followed by vigorous uterine contraction and within 10 minutes a healthy male child was born followed within another 15 minutes by the entire placenta, fortunately without any hæmorrhage. Two drams of liquid extract of ergot were given and repeated after half an hour. The liver remained where it was and did not give trouble to the patient who was none the worse for all this. On my second visit, about eight hours after delivery, I found all the organs, lung, liver and the uterus, in their normal places and the patient had a perfectly normal puerperium.

* Rearranged by Editor.

Indian Medical Gazette

APRIL

TROPICAL TYPHUS

It is against the policy of this journal to enter into any discussion on controversial matters, of a political or even a semi-political nature, and we do not propose to discuss here whether the army in India is a burden to the tax-payer or whether as an insurance against invasion and internal disturbances it is well worth the money it costs. We do, however, wish to emphasize one way in which the army has been in the past, and still is, invaluable to the civil population—namely, as a detector of endemic disease—in a passive rather than an active capacity. Soldiers in this country, whether they be British or Indian, are usually—in the former case always of course—foreigners in the part of the country in which they are stationed; thus they enjoy no immunity against the local strains of infecting organisms, and are not only more liable to be attacked but when they are attacked they react to the infection with severe and usually classical symptoms.

There are of course many examples of this 'detecting' power of the British troops in India. Typhoid fever was at one time unrecognized in Indians, mainly because they seldom suffered from a classical attack, but amongst the British troops it was for many years one of the most important causes of mortality; attention having been drawn to it, typhoid is now recognized as a common disease amongst the civil population. Another example is kala-azar, or 'Dum-Dum fever'—this was recognized as a clinical entity in the army at a time when it was considered by Ross and other workers in India to be a severe form of malaria, and it was from the spleen of a British soldier who had contracted the disease at Dum-Dum that the causative parasite was first recovered.

A recent example is typhus; the sporadic incidence of the disease had been noted, in fact following the infection of the most distinguished of this journal's editors, apparently by a tick, our editorial columns suffered a severe attack of 'tick typhus', and the earliest reference to tropical typhus, which has now been recognized and studied intensively in other tropical countries, will be found in the volumes of this journal. The widespread existence of this infection in India has, however, again been indicated by the army, and in a contribution that appears in the November and December (1935) numbers of the *Journal of the Royal Army Medical Corps*, Major J. S. K. Boyd has analysed the reports on 110 cases that have occurred in the army—or in persons associated with the army—during the year 1934.

Sir John Megaw has suggested that the typhus fevers should be classified according to which insect vector transmits the virus from patient to patient; thus he considers that the classical epidemic typhus transmitted by the louse should be called louse-borne typhus, Brill's disease should be called flea-borne typhus, tsutsugamushi disease—mite-borne typhus, Rocky Mountain spotted fever—tick-borne typhus, and that there should be a group for typhus of an unknown vector. There are many points in favour of this classification, one being that the clinical picture varies according to the vector and that there is evidence to suggest that the virus is in some way modified by the vector that transmits it. The great objection to this classification from the practical point of view is that it is very difficult to be certain in any particular case what the vector was. Sir John suggested that the disease in India should be called Indian tick typhus because in some of the cases described there was a definite history of tick bite and that in most of them there was a reasonable chance that the patient had been bitten by a tick.

Major Boyd attempted to classify his cases according to the vector, but immediately came up against this difficulty, namely, that in almost every case there was no evidence what the insect vector was or even whether an insect vector had been concerned, so that an attempt to separate the cases into groups by this means failed.

The study of typhus during the last quarter of a century has been simplified by the observation that in the blood of patients suffering from this disease there is an antigen active against certain organisms of the proteus group; the presence of this antigen seems to be a fortunate accident because, although these organisms are from time to time isolated from patients, no direct aetiological association with this disease has ever been proved against them. Further help has come from the more recent observations that the different clinical types of typhus are distinguishable by the presence of agglutinins against different strains of proteus. Taking advantage of this observation Major Boyd has divided his cases into three antigenic groups according to whether the patient's serum produces the maximum agglutination with the XK, the X2, or the X19 strain of proteus, and he has subdivided his last group on geographical and clinical grounds. He has thus been able to divide his cases into four provisional groups and in his paper he has studied the epidemiology, the symptomatology, and the laboratory findings in each of these groups separately. These he has summarized in a table which we give below.

There is of course a considerable amount of overlapping in these different groups, and in his conclusions he does not take the view that his

TABLE

	XK	X2	X19	
			Poona-Ahmednagar	Bangalore
<i>Geographical distribution.</i>	Northern, Eastern and Southern Commands except Poona-Ahmednagar area and Madras district. Not reported from Western Command.	Deccan district and Poona Independent Brigade area only.	Deccan district, C. P., and Poona Independent Brigade area only.	Southern Command except Poona Independent Brigade area and Ahmednagar vicinity.
<i>Seasonal incidence</i> ..	Maximum, August and September.	Maximum, December.	Maximum, December.	More or less evenly spread except February, March and April.
<i>Rash—</i> Number of cases* Day of appearance	Br. 15/21, Ind. 1/14 5th or 6th	Br. 8/8, Ind. 5/6 Br. 3rd or 4th, Ind. 3rd to 10th.	Br. 10/10, Ind. 6/6 Br. 3rd, Ind. (average) 7th.	Br. 5/6, Ind. 1/21 Br. 4th to 10th, Ind. 8th.
Type ..	Flush + macules	Macules, papules, petechial.	Macules, papules, petechial.	Maculo-papular.
Distribution ..	Trunk only	Generalized	Generalized.	Four cases trunk only. Two cases trunk and limbs.
Duration ..	7 days	Br. 18.4, Ind. 14.4	Br. 25, Ind. 10.5	Ind. 3, Br. average 4.
Staining ..	Nil	Br. + in some cases	Br. + in some cases	
<i>Duration of pyrexia</i>	Average 14.2 days	Average 12.5 days	15.5 days	10.4 days.
<i>Stay in hospital</i> ..	Average 31 days	Average 27.5 days	Average 29.5 days	Average 24.6 days.
<i>Proteus agglutinins</i>	K + + + 2 — 19 —	K ± 2 + + + 19 ±	K ± 2 ± 19 + to + +	K ±. 2 ±. 19 + + +.

* Numerator shows number of rashes, denominator shows number of cases.

four provisional groups should be considered to represent four different types of the disease, but he thinks that the evidence points to there being at least two, if not three, distinct types of typhus endemic in India. The first is the type in which the XK antigen is present. About this being a distinct type there seems to be very little doubt; it has a symptomatology quite distinct from that of the other type or types, a different seasonal distribution, and the agglutination results are clear cut, there being a strong XK reaction and no agglutination at all with X2 or X19. We quote below a clinical description of this type of the disease:—

'Severe headache was a very constant and early symptom. The face was usually flushed, and the conjunctivæ somewhat injected. Rigors and sweats were common in the early stages, and toxæmia, with its accompanying symptoms of lassitude and drowsiness, was of varying severity. Severe pains in the joints, or "all over the body", occurred in several cases.

The rash was by no means a constant feature, being present in only 15 of the 21 British cases, and in only 1 of the 14 Indian cases. It usually appeared on the

fifth or sixth day, but was recorded as early as the first and as late as the eighth day of illness.

In all cases in which it appeared, the rash was of the type described by Macnamara, and no excuse is made for quoting his excellent description verbatim.

"The rash appears on the fifth day of the disease. A flush may be present on the fourth day. This may be demonstrated on an apparently normal skin by the pressure of the hand. The paler impression produced by the palm and fingers persists on the skin. The rash is that of true typhus, though the lenticular papules have not been observed. It is a dusky erythema, with scattered irregular blotchy underlying macules, purple in colour. The macules persist on pressure in some degree, while the flush fades, leaving the skin very pale by contrast. In severe rashes the macules sometimes appear raised, but cannot be felt. The rash is best seen in the umbilical and epigastric areas, and over the lower ribs. It extends to the sides of the thorax. The distribution of the flush is wider, it is well marked over the trunk, with the exception of the upper part of the front of the thorax, and the hypogastric and iliac areas. It is particularly well seen on the back and between the shoulder blades. The rash has been seen on the upper and lower limbs, but usually these are not affected. It is not very striking in appearance, and may not be noticed. It fades gradually, the flush disappearing earlier than the

macules. As a rule it is no longer visible at the termination of the pyrexia."

It is worthy of note that in no case of this series did the rash become papular or petechial, nor, with one exception, did the macules extend beyond the trunk. The macules were found chiefly on the abdomen and thorax; the face and neck and extremities were unaffected.

The inconspicuous nature of the rash no doubt affords the explanation of its apparent rarity in Indian patients, as it is presumably obscured by the pigmented skin.

The average duration of the rash, calculated from figures given in thirteen cases, was seven days. There was, however, difficulty in determining the exact time when it could be said to have disappeared.

Complications and sequelæ were by no means common [*sic*, ? uncommon]. Nine cases showed pulmonary symptoms, five developing bronchitis, two pneumonic symptoms, and two pleurisy. Three cases developed acute mental symptoms and two others varying degrees of transient paralysis.

The average duration of fever (33 cases) was 14.2 days. During the pyrexial period the pulse rate was relatively slow, resembling in this respect fevers of the enteric group.

Recovery was by lysis, and in some cases by crisis. In uncomplicated cases all other symptoms disappeared and convalescence was rapid as soon as the fever subsided.

The average stay in hospital (35 cases) was thirty-one days'.

He considers that there is a strong clinical resemblance between the X2 group and the Poona-Ahmednagar group, and he does not attach any great importance to their antigenic differences; X2 and X19 are antigenically closely associated organisms and it has been shown in other endemic areas, where a number of people were obviously suffering from the same disease, that the serum of one patient would agglutinate X2 in high titre and X19 scarcely at all, whereas that of another would do the reverse.

From a clinical point of view the main difference between this second group and the XK group is in the rash. This is a constant finding in the X2 Poona-Ahmednagar group, even amongst the Indian cases, it is a florid, very marked rash, in some cases becoming raised and papular, it is generalized and not confined to the trunk; and it appears earlier, lasts longer and usually leaves a stain behind.

The Bangalore group are distinguished from the other group agglutinating X19 by the fact that that agglutination is in very much higher dilution, that the rash is a comparatively rare feature and less marked when it occurs, never becoming papular, and is evanescent, and that the whole disease is very much milder; this group Major Boyd thinks resembles Brill's disease, the flea-borne typhus.

Valuable as this study has been for showing the widespread distribution of the disease in India, it has provided practically no clues as to the nature of the vector. There was little evidence that a tick was the vector in any single case and in a number the possibility of a tick bite seemed to be definitely ruled out.

Little progress in controlling the disease can be made until we know the vector or vectors,

and we are glad to see that the subject is engaging the attention of research workers in this country. Some of the preliminary work on this subject carried out by Colonel Shortt was reported in our January issue and in the January number of the *Indian Journal of Medical Research* there are three papers on the same subject by Colonel Covell.

The former was able to show that the blood of the Kasauli squirrels agglutinated the OXK strain of proteus in much higher dilution than did that of the squirrels collected from the plains, whereas both sets of animals were almost entirely negative to the OX2 and OX19 strains. He also showed that the Kasauli squirrels harboured fleas, whereas the plains squirrels harboured lice.

Colonel Covell isolated a strain of typhus virus, which he was able to maintain by passing through guinea-pigs, apparently indefinitely (up to 10 passages at the time of writing), and he also isolated a typhus strain from a rat flea.

There are of course many insects and many possible carriers to be investigated, but parasitic insects that come in contact with man are more limited and, as Colonel Shortt has pointed out, it seems probable that if these were investigated systematically it should be possible to pick out the potential vectors. The finding of the carrier—and from the sporadic nature of the incidence of the disease it seems probable that the infection is maintained by an alternative host—may present a more difficult problem as this may be some animal that does not come into close contact with man; some domestic animal such as the dog may itself be immune and yet transport the infected insect into human quarters.

There is strong evidence to suggest that there are at least two types of typhus—this is a point about which all the workers we have mentioned are agreed—and it is very probable that each will have its vector and each its natural host, so that a promising vista for research in this disease is opened up.

Commentary

RATS, LICE AND HISTORY

PROFESSOR ZINSSER'S book* is a, or perhaps the, Philosophy of Louseydom: nay, rather the encyclopædia of the subject, the only apparent omissions being any note of the Laplanders' custom of boiling lice in milk with plenty of salt and taking the decoction on

*Rats, Lice and History. (Being a Study in Biography, which after Twelve Preliminary Chapters indispensable for the preparation of the Lay Reader, deals with the Life History of *TYPHUS FEVER*). By Hans Zinsser. 1935. George Routledge and Sons, Limited, London. Pp. xii plus 301. Price, 10s. 6d.

an empty stomach for the cure of 'jaundice', and of Shipley's citation of Theo. Hook:—

'Her ladyship said when I went to her house
She did not regard me three skips of a louse,
I freely forgave what the dear creature said,
For ladies will talk of what runs in their head.'

The essence of the philosophy is a regard for typhus fever as the emblem of 'a protoplasmic continuity' throughout the ages influencing the lives of men, and the author has been led to cast his discourse in the form of a life-history of the adventurous career of his putative hero, Rickettsia, during birth, adolescence and maturity—His death not yet! This biographical fiction is perhaps the only thing in the book that may intrigue the reader. The subject by very token of the philosophy is an immortal, yet a biography in plain English means a story of but the vegetative and slough-destined mortal coil, the reason indeed why one finds, as the author has, that this method of literature goes 'into competition with the erotic memoir' and that its mines of information are 'keyhole indiscretions and other lucubrations'.

Perhaps, however, the author may be allowed with W. S. Gilbert, Lewis Carroll and other artists the licence of clothing his blythe spirit in fancy dress. Anyway, his plot is certain to be a source of delight to the reader for it first leads him into a whimsical dissertation on the modes of biography, he reviews the classical models to the disadvantage of the modernists 'who sit between intelligence and beauty without possessing either' and who burn their fingers with 'Freudian high explosives' and 'appraise their heroes by their endocrine balances rather than by their performances'. 'Poor Shelley, poor Jesus', if it is to be their lot to have '*les petites choses de la vie privée*' exposed to the vulgar gaze. Of course the author chooses the classical model and claims that his subject needs no such assistance as 'psychoanalysis—mother complexes—early love affairs or later infidelities—perversions—the *réclame* of a libel suit barely averted—epidemiologists who talk like the hero of Arrowsmith'—and so on. Nevertheless, the public composed of such as doctors, bookbinders, ministers, and trained nurses want this sort of stuff at the end of a dull day, and so the modernists are not to be blamed overmuch for supplying it. One writer has tried both methods, sometimes satisfying the reasonably intelligent and sometimes 'luring a fat cheque with a story about the poor boy and boss's daughter'.

Then stung by a taunt that biography is work for an artist and not for a scientist the author goes into a flat spin. He protests against the stain-glass attitude of a specialist having no interest beyond his chosen field unless in 'contract bridge' and holds that one type of intelligent occupation increases the capacity for comprehension in general. In any case the essential difference between Art and Science cannot be stated; they are merely at opposite ends of the spectrum of human perception, one grading into the other, while 'beyond one end the senses give out and the physicist joins the Church; beyond the other the artist's brain collapses'; for instance he who perpetrated 'Balloons—coloured balloons—my coloured balloons—balloon balloons—they have punctured my categorical imperative' wrote of the spectrum, and vulcanizing the puncture would have done no good. Even those like Eddington, protagonists of 'mathematical science', 'are constrained to sit down comfortably in their metaphysical toboggans and swish back into the warm vales of theology, they scamper back to God'. 'Kepler being a noble exception, he never wrote a book about God'. Still on this point the author has it that both scientist and artist accomplish no more than a new understanding of things that have always been. They are both observers of Nature and their achievements become Science or Art according to the degree to which the emotion or reason is impressed by them.

In consequence, on thinking over these things the author, luckily for the reader, decided it was safe for

him to write *A biography of typhus* and with a Parthian shaft wished that some of the psycho-analytical biographers could get psychic carbuncles and the lucubrations writers of sexual neuropathics develop infection while playing with *Treponema* as easily as an anatomist can contract it while doing his honest work.

The author has many more digressions from his thesis, but just as important to the understanding of it as are physiology and chemistry to the Art of Medicine. The only pity is he stopped short of many that he provokingly only hints at, for instance on the origin of life he has it 'We all know already that it is a physico-chemical process though we have not yet succeeded in imitating it. And when we do we shall be philosophically just about where we are now'. The author excuses himself for such digressions on the ground that one Pierre Beyle has footnotes four times the length of his text!

Coming now to the biography of his hero and first his gestation in the womb of time he learns something of it from considering that any disease 'represents complex biological interadaptations and interactions covering thousands of years!' He thinks that the louse as a factor in the transmission of typhus arose from an actual discovery by the insect of blood beneath its normal epidermal diet, just as Bobo discovered that roast sucking-pig was food fit for kings and for Bobo, and further he sets forth the evidence of the medical laboratory in an attempt to elucidate the steps in the evolution of the condition, aided by researches in the laboratory of history. The latter method has forced him to ascertain how other diseases have behaved, sometimes appearing whence nobody knows, reaching a zenith and disappearing entirely and equally mysteriously—the disappearance of plague from Europe is not so inexplicable on the theory that the sewer rat exterminated the black rat and removed its close contact with man—or perhaps undergoing mutations, as in the neurotropism that has manifested itself in certain virus diseases such as vacciniasis.

His historical enquiries have led him to delve into the Ayurveda from which he learnt of fevers including malaria, and of cholera. On the subject of acquired tolerance he says 'another 1,000 years might produce a condition in which a peritoneal puncture of almost any *bon vivant* would reveal *T. pallidum* of which the host was all but unconscious. Arsphenamin has now probably ruined that prospect'.

Here indeed is a dissertation on a disease that should be read by all those who want to know not only of the local and present-day genesis of epidemics during their maturity but of their rise and fall as of the rise and fall of Nations. The author's scholarly methods cannot be too carefully studied.

In this crystallization of colloid material these *litteræ humaniores* are embellished with all the figures of speech that go to adorn a tale and to teach profound wisdom to crude minds. The author gets down to his 'muttons' garnished with *saucé piquante*. Every page ripples with aphorisms, axioms, epigrams, delicate ironies, laughter, *obiter dicta*, pretty wit, soothsayings, whimsical 'whimso whamsos' and here are some of the bonbouches (*anglicé*) more or less paraphrased. 'It was bad manners to kill fleas and lice in front of people, at any rate if you did not know them very well'. 'Would Cortez have burned his ships if his wife had been with him? No, he would have gone as far as Orizaba, returned to Spain, and written a book, *Hernando and Juana look at Mexico*'. 'Lice have been important in politics. Persons eligible for the mayoralty of a town would sit round a table with their beards resting on it. A louse would then be placed in the centre of the table and he to whom the louse went was the next mayor'. 'Nature has provided that the nymph of the louse, that is during its high school or flapper age is not yet possessed of sexual organs'—the louse by adapting itself to parasitism has attained the ideal of bourgeois civilization'. 'Bufon and Linnaeus were by this time famous and most likely were occupied in attending Conferences' [sic]. 'The Brown Rat appears to have

had a hard time in 'thrifty' countries. In Scotland it took 60 years to go from Selkirk to Morayshire and has never done very well among the Switzers'—it is obvious that Religion begins where Philosophy takes off from the solid shore of the exact sciences into speculative waters, the shallows of which are metaphysics—citing Shelley 'to analyse a work of art into its elements is as useless as throwing a violet into a crucible'. 'Africa is a playground for museum administrators and their wives, who go there to have their pictures taken with one foot on a dead lion, while disgusted-looking bearers carry boxes of champagne and biscuits on their heads'. 'The louse does not become sexually mature till.....but, then, Oh Boy!' 'The speculation has arisen among religiously-minded louse-scholars as to whether Adam and Eve—the neatest pair that ever joined hands, were lousy'—'in Northern Siberia young women sportingly threw lice at a traveller, who ascertained that this indicated love—a sort of my louse is your louse ceremony!' Let it be remarked that they were head lice.

Many examples among men who were not too unlike rats can be cited. Sam Wesley had 14 children with his good Sukey before he left her because she refused to pray for the lawful King. Then on the accession

of Queen Anne he was reconciled to Sukey and 'bestowed 5 more children on the fortunate woman'. 'Man and rat are utterly destructive, taking all that Nature offers; it is likely, biographically speaking, that the evolution towards higher things may gain velocity with time and that in another 100,000 years the comparison of men with rats may be less humiliatingly obvious'.

This commentary is composed mainly of citations from the book, but there are in it, say, forty times as much again of such good things and, quite apart from the pleasure of reading such a work of art—the spectrum shows the colours of Science and Art combined, there is that in it to make the Doctor worthy of his honorific and less of a *Kauffman*.

If the author modestly felt, when making certain criticisms of a brither Scot, like Neanderthal Man attacking a Mastodon with a peashooter, the reviewer feels rather like the Mayor's daughter when presenting the Princess with a posy.

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Special Article

SHORT-WAVE THERAPY

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THE use of long-wave currents with high frequencies or diathermy is now fairly well established in medical practice, but, during the last few years, the apparatus used in electro-medical technique has been considerably improved and further developed. It is now possible to produce waves of greatly reduced length with a corresponding increase in frequency. These have recently been applied therapeutically in practice. Schliephake, as the author of several essential suggestions regarding the method of applying ultra-short waves in therapy, has deservedly earned a great reputation. It was he who first introduced the use of short waves, on a large scale, into the therapy of various diseases.

At a frequency of approximately 1,000,000 per second, diathermic currents have an average wave-length of from three to four hundred metres, whereas short waves have a range of from 15 to 100 metres with a corresponding increase in frequency. Waves under 15 metres in length are designated ultra-short, their frequencies rising to 100,000,000 and even higher. In order to avoid such big numbers in connection with ultra-short waves, in practical use reference is confined to the wave-length. Naturally, the frequency, corresponding to the speed of electricity (300,000 kilometres per second), is a multiple of the wave-length. Just lately, apparatus has been constructed which makes it possible to use waves only a few centimetres in length. In this case the experimental stage has not yet been concluded. It is quite

possible that further and altogether new therapeutic possibilities may eventuate when these transmitters are further improved.

There are two methods of producing short and ultra-short waves—spark-gap, and valve apparatus. The waves produced by each of these differ to some extent. Spark-gap apparatus produces so-called 'damped' waves, that is, the amplitude of oscillation is uneven. On the other hand, valve apparatus produces undamped waves, the oscillation in this case being even. While this distinction is important from the technical point of view, it has not as yet affected actual practice as both types of apparatus have been used to a similar extent. Of late, however, valve apparatus has been increasingly used in spite of the fact that this type and its use is more expensive than the spark-gap apparatus. The problem thus raised and many others have, at present, not been finally settled.

What is the fundamental difference in practice between long and short waves? In both cases, the production of so-called Joule's heat is aimed at. In other words, electrical energy is transformed into heat when the current passes through a medium such as the human body, which is a bad conductor. By introducing currents of very high frequencies it became possible to administer sufficient quantities of electrical energy to the body without causing any unpleasant sensations, provided that there is close contact between the body and electrodes. Should the contact be incomplete or unequal at any point, diathermic currents are liable to produce sparks or local burns. In addition to this the long-wave diathermic current does not distribute the heat evenly through the body, as the current follows the path of least resistance,

viz., vessels, nerves and muscles which are particularly well heated. On the other hand, those parts of the body which possess greater resistance, such as the bones, are much less heated. In the case of short and ultra-short waves, however, this is not the case. The heat penetrates the body in straight lines without following special conductors. A body between the electrodes of a short-wave transmitter is evenly heated throughout and electrical contact is not even necessary. On the contrary, the heat in the interior of the body is far more evenly distributed if the electrodes are fixed at a certain distance from the body. This has the advantage of precluding possible overheating of the skin and burning. Electro-physically the electrodes thus held at a certain distance from the body act as condensers. The body remains within the condenser field without actual contact between the skin and the electrodes.

Needless to say, such treatment without direct contact involves considerable electrical losses, and correspondingly higher current energies are required to make up the deficiency in resultant heat. As a rule spark-gap apparatus is not adequate for this type of treatment. In practice the gap between the electrodes and the body is produced by the use of a layer of felt, or, in some cases, the clothing of the patient is used for this purpose. Glass electrodes, suggested by Schliephake, permit regulation of the distance at will. They consist of a glass vessel, containing a movable electrode, which is placed on the body. The distance of these electrodes from the body may be varied from half to five centimetres.

In order to understand the effect of the short waves better, their action in the body may be considered. Diathermic currents are distinguished from galvanic and faradic currents in their physiological effects, in so far only as they do not irritate the sensory or motor nerves. For the rest, the principles which apply to Ohm's Law and Kirchhoff's Law of distribution (according to which the current follows the path of least resistance) are also valid in the case of diathermic currents. This does not hold good in the case of currents of ultra-high frequency. There is no difference between good and bad conductors, for even the bones, well known as the worst conductors in the body, are traversed by the current and heated. To achieve this with diathermic currents was formerly almost impossible.

Some other important qualities must now be noted. Diathermic current is not able to pass through the red blood corpuscles surrounded by a cell membrane. According to Ohm's Law it passes through the serum, and the blood corpuscles are heated only to the extent that the serum is heated. The ultra-short-wave currents, however, easily traverse the cell membranes and thus they warm the red corpuscles in their interior. It has even been stated that the blood

corpuscles are heated to a higher degree than the serum. Similarly, cells of varying structure are differently heated, while it is possible that the cell nucleus may also be heated differently from the protoplasm around it. The same applies to the heating of colloidal solutions. Whereas a watery solution of egg albumin coagulates at a temperature of 62°C., when heated by ultra-short waves an opalescence may already be observed at only 57°C. The explanation is that the molecules of the albumin have already reached a temperature of 62 degrees and coagulate, although the medium of the solution has only been heated to a temperature of 57°C.

Similar conditions may be observed when experimenting with bacteria. Schliephake noticed that staphylococci, which die in a water bath at 55°C., when inoculated into dead bodies died at a temperature of only 40°C. in the surrounding tissue. However, tests, taken from controls which had not been treated, yielded very good sub-cultures. Liebesny made extensive experiments, which showed that quite different wave-lengths were required in order to kill different micro-organisms. This, no doubt, will be of the utmost importance in practical therapy.

Quite recently, specific effects were observed on particular groups of body cells. When traversed by waves of from 3 to 4 metres in length brains of rabbits were damaged in certain particular ganglion cell groups while others adjoining were unchanged.

Again, Reiter showed that, when inoculating cases of sarcoma in rats the tumour cells were destroyed without the surrounding tissues being damaged by the heat. But this was only possible at a wave-length of 3.40 metres: other wave-lengths did not yield a similar result.

These facts make it sufficiently clear that the effects of ultra-short waves are altogether different from those of other types. But it must be remembered that experiments in this direction are only in an initial stage. Investigation on an adequate scale will show in years to come to what extent these specific results are of practical importance. The hope is justified that further experience will reveal more and more indications.

Still another and very promising field which has been recently explored is the treatment of progressive paralysis of the brain, which has been considerably improved by this method.

On the basis of experience gained to date, the question is: what range of indications of short-wave therapy may we consider definitely established? The success of the treatment in cases of acute inflammation of the skin such as furuncles and carbuncles is unchallenged. Here especially the contrast between the effects of ultra-short, short waves, and the long-wave diathermic currents is particularly noticeable. It is well known that diathermic currents often

induce further progress of purulent affections so that generalization and even sepsis may result. In such diseases diathermy therefore never, on any account, must be applied. On the other hand, the effect of short-wave currents in such cases is surprising in its healing power, even on larger furuncles or carbuncles. Where no pus has, as yet, been formed pain and inflammation subside almost invariably after the first application. Frequently complete retrogression and resorption, without any formation of pus, can be achieved. In more advanced cases, several applications will prevent further development and may result in complete healing after a small central necrosis has been formed. Very impressive results have been observed again and again, in the treatment of extensive carbuncles. A few days ago, for instance, I was able to effect painlessness after an application of 15 minutes on a carbuncle in process of formation on the thigh of a patient. It had already infiltrated the tissue around across a diameter of 4 inches. The next day, immediately after a second application, a small slough came out and the carbuncle receded and healed. Had it been treated surgically two or three weeks would have been necessary for a complete cure.

Not only in the case of furuncles or carbuncles but also in cases of whitlows and especially of pus formation in the ear, which is extremely painful, I have achieved freedom from pain and retrogression in many cases. Frequently, only one application was needed for this purpose. The same applies even to extensive phlegmonous processes, erysipelas and purulent infiltrations in the subcutaneous tissue, including that of the mammae.

A further most important and especially successful field for treatment by ultra-short waves is that of purulent inflammations of the sinuses of the nasal cavity. The unbearable headache caused by acute inflammation of the frontal sinus decreases in intensity, as a rule after the first application. Usually after 3 to 6 applications the disease is cured. Formerly a large percentage of cases could only be treated surgically. To-day this simple treatment cures almost with certainty even sub-acute or chronic cases. Here again the contrast in the indication of treatment by diathermy must be noted. In these diseases also treatment by diathermy is strongly contra-indicated. In this connection a most instructive case was observed: the patient, before consulting me, had been treated diathermically for inflammation of the right frontal sinus. After two diathermic applications the pain increased so greatly each time that he refused diathermic treatment. Immediately after the first application of short-wave treatment there was considerable improvement and after four further applications the patient was discharged completely cured.

Short-wave treatment is not, however, restricted to the above-mentioned affections. It

acts similarly on acute inflammatory changes of almost every organ, especially in diseases of the roots of the teeth, tonsils, prostate, joints, bones and also those of the female organs.

In an exceedingly painful case of acute gonorrhoeic arthritis of the left wrist, I personally observed how the pain almost completely subsided after the first application. All the symptoms of the disease completely disappeared after a few more applications. A case of a female patient of about 30 years of age was specially remarkable. For ten days she had suffered from severe tonsillitis with a temperature which daily rose to 103°F. During the days preceding the first application, a big swelling of the glands had formed on the left side of her neck. This threatened to become purulent. A few hours after the first application her temperature fell to normal, while on the next day pus was no longer visible on the tonsils and the swelling of the glands had diminished to less than half. After the second application the swelling of the glands completely disappeared and the patient was cured.

Although I had previously no opportunity of observing cases of osteomyelitis I treated a case of otitis media with initial suppuration of the mastoid. Ordinarily, most probably, this would have needed operation. After a daily application for a week there was no discharge and no further pain and the patient was discharged.

It has been shown that the field of indications for treatment by electric currents in acute diseases as described above is altogether new. The success in many of these is actually surprising. Moreover there are very good prospects for short-wave treatment of cases hitherto allocated to the field of diathermy. Nevertheless it must be frankly admitted that in such cases success is not always convincing. Some, like Stieböck, reject even short-wave therapy. Schliephake considers the treatment of chronic arthritis by short waves as a very favourable indication. It must be understood, however, that fixations, already formed, and also osteophytes, cannot be made to recede. From my personal experience I have proved that short-wave therapy succeeds much quicker than diathermy in removing effusions of the joints and pain, even in cases of long standing which have resulted in grave radiological changes. It goes without saying that such cases cannot be cured and that relapses are possible. Still, a lessening of the pains in the joints considerably greater than that achieved by diathermy can be effected.

Success in the treatment of muscular rheumatism and neuritis is even less satisfactory. My experience in this field does not indicate any considerable advance upon previous methods.

But in treating chronic diseases of the abdominal organs surprising success may be achieved. A patient who had suffered for years from a gastric ulcer, radiologically proved, and who

had had an operation upon his gall-bladder and appendix on account of the pain he had suffered for 20 years, was cured after a few applications. At the present moment it is impossible to judge how long this success may last. Still, for the last five months the patient has had no pain whatsoever, whereas for the previous 20 years he had never been free from pain for anything like such a long period.

A further case was one of chronic gastritis with large radiologically-proved adhesions after a very severe appendectomy with peritonitis. For years there had been regular and severe vomiting every morning after getting up. In this case, too, entire freedom from the complaints was established after a few applications. The result was the same in a similar case of severe gastritis and peri-gastritis after operation.

On several occasions, moreover, I observed in cases of gynaecological applications that a discharge due to various causes stopped immediately after the first application and did not reappear during the period of treatment.

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The above enumeration of indications of short-wave therapy cannot claim to be exhaustive. At the present stage it is scarcely possible to be definite regarding the indications. We have also to admit that even the most experienced authorities on this subject are yet of different opinions. It is even not yet generally agreed whether the effects are definitely specific. It has been my endeavour to show that it is unanimously admitted that to-day short-wave treatment has considerably enlarged the scope of the field of electric therapy.

Success has been achieved where but a short time ago it seemed scarcely possible. Continued and varied experience will undoubtedly produce further new indications. To-day we are fully justified in assuming that the study of the effect of particular wave-lengths, which has only just begun, will lead to further results of great therapeutic value.

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The Council proceeded to record the reply received from the Government of India, in connection with the suggestion received some time ago that the practice

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unfortunately only for a short time, all the metabolic defects. These defects consist essentially in a failure to burn and store carbohydrate food (glucose) in the tissues, with resulting hyperglycæmia and glycosuria, and a concomitant failure to metabolize fats, which shows itself in a progressively severe production and excretion of acetone bodies (ketosis) as the carbohydrate burning (the carbohydrate tolerance) becomes less. An injection of insulin, if a large one, abolishes this diabetic process in a few hours. It reduces the blood sugar, it refills the depleted glycogen stores in the liver, less noticeably in the muscles, and when this is done it produces *pari passu* the disappearance of ketosis. The diabetic metabolism is temporarily normal. The exact chemical step it performs in the diabetic defect is not known, but although its effects are widespread, I think it probably only performs one step in the complexity of carbohydrate chemistry.

Another aspect to be considered is the action of insulin on the blood sugar and carbohydrate metabolism of non-diabetics, because they are many non-diabetic conditions in which the use of insulin has been advocated.

When insulin is injected into normals, the blood sugar is always lowered and definite hypoglycæmia is produced if enough is given. Ten units produce appreciable symptoms of hypoglycæmia in most normals when given fasting, fifteen in all, and twenty units quite severe symptoms, usually in two hours. This can always be prevented by the giving of carbohydrate by mouth to balance it. The symptoms of hypoglycæmia are much the same as in diabetes: weakness, tremors, sweating, but hunger is a very common and marked symptom which has been turned to clinical use in stimulating appetite.

There is no evidence that the giving of insulin to non-diabetics increases or affects their metabolism in any specific way, or, indeed, acts as a general tonic. They have already enough insulin of their own.

Another point to mention is that on the current view of insulin production and action, the giving of carbohydrate, usually as glucose, always produces enough insulin to 'look after' the glucose and that the administration of insulin with the glucose is unnecessary to ensure the latter's metabolism. There may be an advantage in adding insulin to glucose in severely ketosed and toxic patients whose production of insulin (to use the current phraseology) may be depressed. But it should be remembered that the giving of insulin alone to such patients with normal blood sugar will not reduce ketosis and is certain to produce symptoms of hypoglycæmia.

I hope this short outline of the physiological action of insulin will enable us to appreciate its use and abuse, both in diabetes and non-diabetic conditions.

Diabetes mellitus is the main indication for the use of insulin. It should be used whenever the utilization of carbohydrate by the diabetic is insufficient to maintain the weight, health and energy necessary for the demands of life, as shown by the persistence of glycosuria, ketonuria and ill-health symptoms in diabetics on restricted diet. It is essential in the treatment of coma and for the continuous welfare of most cases under forty, and in all children diabetics. Many mild cases of diabetes, mostly elderly, do not need it, but most would benefit and would be safer from complications with it; and its use where it is not strictly necessary cannot be termed an abuse—unless it is psychologically harmful. It may be essential, too, to steer quite mild diabetics through the temporary rocks of illness or operation, which makes diabetes worse.

Its chief use is, therefore, to metabolize an adequate diet for the patient's welfare by which he can and should be maintained in normal health, unless other complicating disease is present. I take it, therefore, that unless insulin is producing this happy result it is at least being misused (improperly used) if not abused (wrongly used).

The main difficulty which leads frequently to misuse is the fact that the action of insulin is *quantitative*,

and that patients on the same diet require widely different doses of insulin to control the diabetes and to keep them well. This is not the place to discuss details about diabetic diets, nor what is the best level of carbohydrate, protein and fat, nor total calories, for the diabetic to live with. Some require only 10 units a day, others over 100, and perhaps an average dose in long-standing cases is 40 to 70 units. The commonest error is to give too little insulin—in such insufficient doses that heavy glycosuria and ketonuria persist and the patient derives little real benefit from the daily injections. Equally unfortunate is the patient who is given too much insulin, and is frequently made wretched by hypoglycæmic symptoms. The dose of insulin is always an individual one which must be worked out individually to get the best results and keep the diabetic metabolism as normal as possible. Another difficulty is the necessity of varying most people's dosage from time to time. If these adjustments are not made, a serious misuse of insulin will arise to the detriment of the patient.

It is worth considering the use of insulin in diabetics who, from carelessness with diet, or the irregular necessity of their life, make it quite impossible to control their diabetes at all completely. In other words, they are usually loaded with an excess of sugar both in the blood and urine, if an attempt is made to control their diabetes more completely with large doses of insulin when they eat less carbohydrate than usual. If in these cases two fairly large doses of insulin (20 to 30 units) are given twice a day, such doses metabolize enough carbohydrate to keep ketosis away and to maintain the patient in tolerably good health. Minor symptoms of diabetes—some thirst and polyuria—will be present off and on, but weight and energy will be maintained in spite of heavy glycosuria. Some clinicians are content to use insulin in this way, and it is certainly better to do so than not to prescribe it at all in careless patients. But it is certainly unphysiological to live with a blood sugar from two to four times the normal; the diabetes quickly becomes maximal, and I believe these patients are much more liable to eye and other complications than those who are better controlled.

A serious abuse of insulin in diabetes was prevalent, especially in France, but I hope is now dying out. The method was to give short intensive courses of insulin injections for two to four weeks and then to stop it. These cases, if at all severe, were rapidly improved in strength and weight, but deteriorated again almost as quickly when insulin was withheld. Indeed, there was risk of coma when the treatment was interrupted, a risk which is always present in severe cases (40 to 60 units a day) when insulin is stopped. When we remember that the action of the largest dose of insulin never lasts for more than twelve hours, it is obvious that such intermittent administration can never be successful in maintaining good health in severe cases. It does not mean, however, that milder cases may not come off insulin, and everyone with much experience will agree that insulin may often improve diabetes so much that injections can be given up. The true use of insulin in diabetes can be summed up as the administration of enough insulin to metabolize sufficient carbohydrate to maintain health and strength, a balance of diet and insulin. The main abuses arise from a failure to appreciate its quantitative and short-lived action.

When we pass to the use of insulin in non-diabetic conditions, I feel that we are on more uncertain and insecure ground. It has been recommended in a legion of diseases, and one gets the impression that it has often been used merely because it has such marvellous effects in diabetes that there has been the tendency to 'try it on other metabolic dogs'. When we remember that normal individuals produce sufficient insulin of their own when carbohydrate is administered, we must be sceptical about the effect of adding small doses of insulin to large amounts of sugar. I shall now consider some of the conditions, metabolic and others, in which insulin has been advocated.

One of its earliest non-diabetic uses was to *fatten the thin*, to combat *anorexias* and to prevent *vomiting*, all of which we may consider together. A large literature grew up, especially in Germany, over 'maskuren' with insulin, and in most cases it appeared possible to increase weight with liberal diets and two to three injections of insulin a day, from 5 to 20 units, given before meals. Sometimes this weight was retained when the insulin was stopped and sometimes lost. Some thin people failed to respond altogether, and the treatment has not been universally adopted; and certainly claims that insulin is a general metabolic tonic in normal people have never been scientifically established. It is doubtful if insulin injections can make normal individuals utilize their carbohydrate any better because they produce a sufficiency of their own. But one thing that insulin can often do is to promote appetite and even cause intense hunger when enough is given to produce mild hypoglycæmia, which may force the anorexic patient to eat. Hypoglycæmia occurs in normals some 30 to 45 minutes after an injection, or some two to three hours after a buffering meal. To get the best effect on appetite, therefore, time should be given between the injection and the meal for the blood sugar to drop a little, and another feed of carbohydrate must be given two to three hours later to prevent unpleasant hypoglycæmia. In nervous anorexias, of course, the psychological effect of two to three needle pricks a day may be an important factor *per se* in producing a healthy attitude towards food. Insulin has been widely used in tuberculosis, and good results both on appetite and weight have been published.

A very legitimate use for insulin is in any condition of undernutrition or prolonged vomiting in pregnancy or after anaesthetics which has produced a heavy *ketosis*. Here a vicious circle of vomiting and ketosis is present, and although the giving of carbohydrate, especially glucose, would slowly remove the ketosis the organism is not able to produce insulin or metabolize carbohydrate very readily. The administration of 10 to 15 units of insulin with each 50 grams of glucose will remove the acetone bodies more quickly. Again, it should be remembered that more carbohydrate must be given some three hours after the insulin, otherwise hypoglycæmia will result.

Insulin has been, and still is, used in other metabolic diseases, particularly Graves' disease. This is a catabolic disorder with overactivity of the sympathetic system, which insulin with its anabolic and parasympathetic action might reasonably be expected to antagonize. I made this deduction myself and was probably the first to try it in this country. It is usually possible to fatten these patients with insulin and perhaps to make them stronger for operation. But in my experience I think it has no fundamental effect on the hyperthyroid process and is futile compared with iodine medication.

Insulin has been used in pituitary cachexia (Simmonds' disease) but I have no experience of this.

Again, insulin has been advocated in all sorts of toxæmias and septic conditions, from puerperal sepsis to the toxæmia of diphtheria, and a section of my card-index system is overflowing with those (unread). It will be noticed that in all such conditions it is a question of giving a little insulin with much glucose, and the injected insulin often gets the credit due to the valuable sugar food.

It is convenient to consider the effect of insulin on the diabetic and normal heart together. It is well known that the glycogen content of the diabetic heart, unlike the liver and skeletal muscle, is not reduced and is usually actually increased above normal. This shows that the carbohydrate metabolism of the heart is not dependent on insulin for glycogen formation, but it is equally certain that the diabetic heart utilizes much more glucose when insulin is given. Some reliable recent experiments showed that the increased use of sugar was fourfold after insulin. Clinical experience bears this out, and it is remarkable how much the heart efficiency often improves when insulin is given to

diabetics. On the other hand, partial heart failure and anginal attacks have sometimes been induced in myocardial and vascular degeneration when the sugar content of the blood is too quickly reduced by insulin. One must conclude that such hearts have been accustomed to function their best for years with a high concentration of sugar in the blood and miss its reduction even to normal figures. Hypoglycæmia produces changes in the electrocardiogram in both normals and diabetics, changes which may persist for some time after the blood sugar has been raised. But these hearts benefit enormously from insulin continuously used. It should be mentioned that Lovatt Evans and fellow workers have recently suggested a glucose-lactic-acid system of carbohydrate utilization by the heart apart from glycogen, and it may be that efficiency of this system is upset when the glucose is suddenly reduced by insulin.

In myocardial degeneration in normal individuals, glucose and insulin have been, and are, largely advocated as increasing the efficiency of the heart muscle. On physiological grounds I can see reason for giving glucose, but none for insulin, but hope to hear the opinion and experience of cardiologists on this point.

It will surprise many of you to hear of the number of other conditions for which insulin has been recommended, supported in all seriousness by publication of a few good results: Peptic ulcers, skin ulcer treated by local application, asthma cured by glucose and insulin, cancerous processes improved, morphine addicts helped, and I could mention many more. I have no experience of these, and look upon the claims as fantastic and the methods a serious abuse of insulin.

To sum up, I should say that the chief use of insulin is to maintain life and health in severe diabetics who cannot tolerate adequate diets without it, and this involves its continuous use. It must also be given temporarily to improve milder cases and to steer them past complicating illnesses or operations. In normal individuals its clearest indication is to aid in the removal of ketosis by giving it with carbohydrate, and to stimulate appetite and hunger by causing mild hypoglycæmia.

Investigations on the Outlook on the Diabetic Life

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(Translated from the German manuscript by Rai Bahadur Dr. Shiam Manohar Lal. The paper appears in a slightly different form, in the *Wiener Medizinische Wochenschrift*, Jahrg. 83, 25th November, 1933, p. 1337)

It is now generally accepted that diabetes is constantly on the increase specially among cultured people. In India also, diabetes is very common among the educated and many eminent Indians have lost their useful lives either directly or indirectly through diabetes. It has been established by statistics that diabetes has increased from nearly 0.5 to about 1.5 per thousand among the Germans, Swedes, Dutch and other races allied to them. And also, the proportion of diabetic patients as compared with other patients has considerably increased in the larger hospitals. It is certainly very difficult even on the basis of these statistics to come to a definite conclusion about the increase of diabetes. Should we not rather come to the conclusion that owing to the improvement in doctors' education, owing to the increasing knowledge of the general public and owing to the systematic examination of urine by doctors in schools and insurance companies, diabetes is more often diagnosed now than hitherto. It must be finally remarked that owing to the use of insulin in the treatment of this disease the average life of a diabetic patient has been considerably lengthened with the result

that to-day there are more diabetic patients alive than ever before.

Even if it turns out to be a fact that the increase in the frequency of diabetes is only plausible, nevertheless the fact remains that the recorded number of diabetic patients is shockingly high. Umber estimated their number in Germany to be about twenty thousand in 1916 and Katsch considers them to be about one hundred and fifty thousand in 1934. According to Joslin the number of diabetic patients in the U. S. A. is very high. On account of this great increase of the diabetics in all the countries of the civilized world the problem concerns not only the physician who intervenes by curing and preventing the disease but it also interests the whole world as it has a social aspect possibly associated with inheritance.

This paper is chiefly concerned with the question of the change which the treatment of diabetes by insulin has produced upon the outlook and which consequently has in its turn produced its influence on the general public. In the pre-insulin era the statistics of mortality gave a very unfavourable idea of the average duration of life of the diabetic.

Surely the age of the patient at which diabetes develops in a particular case is of utmost importance.

Joslin's large statistics contain the duration of diabetic lives from the beginning to the end of the disease in 592 patients. I have simplified the statistics and have come to the conclusion that the expectation of life is lessened the earlier the disease breaks out. The average duration of life among diabetics may be regarded as 48 years.

From the statistics of the pre-insulin era we are driven to the conclusion that diabetics mostly died of diabetes. According to van Noorden 25 per cent of the diabetics died of coma; according to Joslin 51 per cent. The diabetics are further prone to tuberculous infection which causes death of some; premature arterio-sclerosis leads to gangrene of which many diabetics die.

One would expect that the prognosis of the diabetics would have so much improved by the discovery of insulin that they would reach the age of a non-diabetic man; so if the hypothesis that the diabetic disturbance of metabolism is a deficiency disease be correct, then we may expect that the defect can be completely met by insulin in the same way as in myxœdema we can relieve the condition by thyroid substance.

It is surprising that large statistics about duration of life and mortality of diabetic patients which have been published after the discovery of insulin in different parts of the world give such a favourable result as we did not expect. Joslin has convincing data to show that the average life of a diabetic patient has increased to 77 years, giving 29 years more for a diabetic to live.

It is also proved by statistics in Germany that deaths from diabetes in hospitals have considerably diminished; only those diabetics die who are not protected by insulin and their working capacity is also relatively small.

Among the higher classes of society the results are still more favourable; while the mortality among the poorer classes was very high according to Reinwein and Parker in the Hospital of Wurzburg, it amounted to only 13.6 per cent among the higher classes. It is also remarkable that death among diabetic children has considerably diminished and according to Joslin and White it is 12 per cent and according to Wanger and Priesel it is only 1 per cent.

From these facts it is abundantly clear that we can form a positive opinion about the utility of insulin not only from statistics but also from our experience of individual cases. Apart from the treatment the result depends also on many other factors such as the peculiarity of the case, complications and systematic regime. The last is influenced by external conditions of life such as psychical condition of the patient and his attitude towards the disease.

II

Let us first of all consider the peculiarities of the case. It is well known that human diabetes appears in manifold forms. Though in the majority of cases the insular organ is diseased, there are other forms in which from development of symptoms we conclude that the endocrine glands (thyroid, hypophysis, suprarenal) are at fault whilst in many other cases the disease is due to defects in the central nervous system. If we do not take into account these relatively rare cases only two forms remain to be considered:—

The one in which the patient continuously loses weight and becomes thin, and the other in which the patient is corpulent and shows little tendency towards losing flesh. It is very interesting that in the ancient books on the Indian system of treatment these two forms were differentiated and mentioned so long ago as six centuries B.C. Professor Wickrama Singh, the Sanskrit scholar, called my attention to a work by T. A. Wise published in 1845, in which it is shown that the sweet taste of diabetic urine was known to the Indian doctors and they characterize both the forms due to the one fact, *viz*, sweetness in sugar.

In one form the disease is described as congenital in which the patient becomes weak, loses flesh, his skin becomes rough and the patient eats much food, drinks much water and is always restless. In the other form the patient is fat, takes much food, the surface of the body is soft and oily; they are sedentary and sleep much. In the treatment of the first form nourishing food is recommended and for the second form easily digestible food with occasional fasting is recommended. In the year 1877, after two thousand and five hundred years this differential diagnosis was introduced again by M. Laucaran and his pupil Lapierer. They differentiated an acute form which they attributed to diseased pancreas and which they called *diabete maigre* or *diabete pancreatino*; and the other a chronic one affecting fat men which they called *diabete gras*. German Doctors Naunyn and Noorden have used this differentiation.

The characteristic of *diabete gras* is high blood pressure. Hitzberger has been the first to prove by statistics that such is the case and I have also found in my private patients that high blood pressure is more frequent in diabetics than in non-diabetics of the same age. Rschmidt later on put down the behaviour of blood pressure as the chief point in differential diagnosis.

For the differential diagnosis between these two chief forms of diabetes I have found out a new symptom, *viz*, the different sensitiveness towards insulin. I have done this in collaboration with Radoslav, Mpisch, Hogler, Boller, Schwarz and Fenz.

Radoslav has demonstrated by experiments how the reaction to insulin in different cases differs. This difference in the sensitiveness is in proportion to the gravity of the case. It becomes clear by the examination for the deficiency of insulin. This is the quantity of insulin which is necessary to render the patient's urine sugar-free on a fixed diet and to keep him so. Since the introduction of insulin I have estimated this deficiency in about two thousand cases of diabetes and thus I have been able to compare the deficiency of insulin in different cases on the one hand and the amount of insulin which is necessary to keep the patient sugar-free in every individual case on the other hand.

It has been proved from statistics that the want of insulin in different cases differs to an extraordinary degree and that it has no constant ratio as regards the diabetic disturbance of metabolism. For instance one patient with the standard diet excreted about 150 grammes of sugar and needed only about 30 units of insulin to render him sugar-free, whilst in another case, who excreted 150 grammes of sugar, 280 units of insulin were necessary to render the urine sugar-free. If we divide the quantity of sugar excreted by the number of units of insulin to render the individual sugar-free, we get the glucose equivalent (g.e.).

In the first case it is about 5; in the second case it is 0.4. In the course of treatment which lasted through several years it was found clinically that one case was not at all more difficult than the other.

We can fix the g.e. by the experiment of stopping insulin for one day and thus noting the amount of sugar excreted which is in proportion to the insulin-want. This method is specially important in those cases in which we cannot leave the patient for a long time on a fixed diet without incurring the danger of onset of ketosis. Such was actually the case with a patient in whom by stopping insulin symptoms of coma began to appear. This case showed that the g.e. does not go parallel with the severity of the case. It has been urged that the sensitiveness to insulin depends upon so many other factors such as the form of food and complications of infection, that the g.e. cannot be of any value in the differential diagnosis of various forms. I refute this objection. Regarding the food, my patients were all on a fixed diet. As regards infection I have found that they increase the insulin-want and decrease the g.e. Also psychical emotions, anaphylaxis, etc., can influence both the insulin-want and g.e. There is always the question of temporary insulin resistance. When the cause disappears the true character of the special case again comes to light.

I think my statistics are convincing because I have in a large number of cases estimated the insulin-want and the g.e. for many years in a systematic way. In the insulin sensitive case the g.e. is very high already in the initial stages and remains constant and subsequently arises even higher. The g.e. of the insulin resistant cases is small from the beginning and remains so during the whole course. If an infection supervenes the g.e. declines temporarily only in the insulin resistant cases but the differences are never high. It appears that the g.e. increases in the insulin resistant cases which I have observed for 6 to 8 years.

The observations based on quite a large number of cases, therefore, undoubtedly established the fact that sensitiveness to insulin is a peculiarity fixed in the constitution of every individual. Somehow this peculiarity depends upon the age of the individual. Specialists in treating children's diseases also say there is no constant insulin resistance in them; if it is at all found it is temporary. We find the constant insulin resistance only in the middle life and upwards but there are also cases in older people who are evidently insulin sensitive. This variation in the sensitiveness to insulin is directly related to the differential diagnosis of both the forms of diabetes. I have already said that frequently in children and young patients who have a tuberculous tendency the insulin resistance is very small while it is very high in patients of middle age and higher life, in whom, latter, adiposis and hypertony often coexist. The first have a progressive character with some variation; the last show frequently slow progress. It would be quite wrong to record the last cases as benign ones because they can take clearly a progressive character as has been frequently seen.

I should go far if I enter into the question of the pathogenic differences between these two groups. Only in a short way, I will state that insulin sensitive cases are probably insular in origin; though there is, nevertheless, a similarity in pathological anatomy on this point. Mostly the insulin resistant cases show a special constitution and insular preponderance.

III

Now I start with the chief part concerning the course and prognosis and also expectation of life in various diabetic forms. The most favourable cases are those in which the treatment is aetiological because the disease is then completely healed. On this point unfortunately the treatment of the diabetic is still in its initial stage. For the most part the treatment consists in regulating diet and administering insulin. As regards the diabetic treatment, which was available in the pre-insulin era, the results were seldom satisfactory in the

real insular cases though I do not in any way under-value its importance. There are too, as mentioned above, the real insular cases with slow progress in which we can proceed by regulating the diet and for years such cases can be kept in good health and state of nutrition. The course of insular cases was in most cases progressive as the inclination to ketosis was progressive in the days before insulin was discovered. We had to resort to oat-cure (introduced by van Noorden) and the treatment with cereals recommended by many.

By the discovery of insulin the course and prognosis of this group of cases has been much changed; we compensate in the shortest time their diabetic metabolism disturbance and make the patient speedily sugar- and acetone-free, restoring the normal state of nutrition and enabling the muscles to function in a normal condition. Under insulin protection a normal development of young individuals can be obtained. In short such individuals can be made by insulin strong and efficient men with healthy appearance, even though early in their life the disease was progressive. Pregnancy of women can be made not only quite normal but also, it is to be mentioned, that they frequently produce abnormally tall children so that Cæsarean section becomes necessary.

What happens to these cases further on? I have collected a number of cases both from hospital and private practice to show this. Besides the question is of special interest, whether by continuing insulin protection the progress of the disease can be stopped or not. Besides we can find out whether the disease is or is not of the insular organ. Regarding the prognosis of life of the established insular cases, the blessing of the insulin for the diabetics is to be seen in the best light. The same holds for less serious cases for they know for a certainty that they continue their life by insulin protection as soon as it is found out that the mere regulation of diet is not sufficient. Worse cases whose life cannot be prolonged can still be kept in a condition of good health and nutrition with the help of insulin. Their normal capacity and their development can also be kept normal, should the disease start at an early age in childhood. Nevertheless, the experience in such cases till now is not of a longer duration than 12 years, so there is nothing at present against keeping them under the protection of insulin for a longer time.

Such a favourable course unfortunately can be expected only with good life condition and according to the character of the patient himself. The prognosis for life in these cases is very unfavourable. Naturally they desire the restoration to a non-diabetic life. Then the life of such men must have some relation to insulin protection. It may also happen that some accident may make the patient for a short time inaccessible to insulin or hypoglycæmia may set in. By careful watching the hypoglycæmic attacks can be avoided though when the treatment is to be continued for years such a possibility does exist. Such a hypoglycæmia might be fatal to the patient. One of my patients, who was very careful and was splendidly trained, one day swam out in a bathing place too far and did not return any more, as most probably he had had a hypoglycæmic attack.

Do not forget that such individuals should never be regarded as normal and the choice of profession for them should be limited. As hypoglycæmic attacks cannot be avoided, such professions should be closed to them where a hypoglycæmic attack would prove fatal such as the profession of chauffeur, pilot or a mechanical engineer.

Further, useful operations have lost their former danger and complications, of which we were afraid before, can be better met, though there is still some risk of some complications appearing under conditions to which the patient is not adapted, for instance falling ill in foreign countries.

If insulin intoxication be at all a common condition a great experience would be gained and it would be

possible to follow the waves of the blood sugar with insulin and make them correspond with the irregularities such as cannot be avoided in operations. Such mistakes chiefly occur when sufficient stock of glucose has not been provided to the patient by the administration of sugar and insulin. The exact amount of insulin required is often rendered more difficult. Nervous emotions sometimes overthrow the whole elaborate work and in such the danger of bad hypoglycæmic attack is proportionately greater of course.

Now I come to the prognosis of life of the second group of cases which are insulin resistant, that is they are insular in origin having an extra-insular preponderance. I have collected a series of such cases which can be accepted as types of this class.

First I will speak of less serious cases who are fat and have a high blood pressure. The beginning in general is acute. The sugar lessens easily in unprogressive cases either by regulating diet or by regulating high doses of insulin. With insulin, urine becomes sugar-free much more quickly and a higher tolerance of carbohydrates seems to be reached without insulin. Often recovery of an enormous tolerance for food without insulin can be reached, in some cases there are always relapses. In serious cases constant insulin protection from the beginning is required.

In regard to the prognosis of these cases I like to restrict myself shortly to the following points:—

(1) In the majority of cases progress is slow and they take a long time to recover; urine becomes sugar-free with large doses of insulin. Metabolism is enormously improved but relapses are frequent. If continued insulin treatment is necessary then it is very costly on account of high doses of insulin necessary.

(2) In estimating the duration of life one should bear in mind that there is not only diabetes but a adiposity and hypertony to be taken into consideration.

(3) If the disease is long continued, sclerosis is likely to set in. These are the cases in which sooner or later sclerosis of coronary, cerebral, kidney and extremity arteries is liable to develop.

Before I begin with complications I must mention the so-called chronic diabetes in which the progress is extremely slow. In the majority of cases there is sclerosis in the artery of the pancreas which causes mild diabetes. Often sugar disappears without any help for a short or long time or even permanently. Naturally the prognosis for life is greater under favourable expectant treatment.

IV

Complications are of special importance for prognosis. There was always Damocles' sword hanging above their heads before the insulin days. Therefore the outlook was bad, metabolism being in a high degree of instability producing ketosis very often. In chronic cases or in cases with frequent serious relapses they influence the progress unfavourably either on account of the damage to the insular organ by the augmentation of extra-insular factors.

They were more dangerous also because the treatment was more difficult. Many complications such as disturbances of stomach and intestines, kidney diseases, etc., required a diet which was quite opposite to what was suited, for their diabetes, before insulin was discovered. There are two groups of complications of diabetes; one group consists of complications produced by diabetes itself and the other to accidents.

To the first group belong all those conditions of illness in which there is a bad tendency of healing up of tissues and a liability to infections (such as pyorrhœa alveolaris, furunculosis, phlegmon, etc.).

Again, there are complications of nervous system and the skin (pruritus, eczema, etc.), cataract, premature arterio-sclerosis, angina pectoris, contracted kidney, apoplexy, gangrene, etc. Concerning now the purely insular cases, formerly the opinion of the specialists for the diabetes of children was that complications in diabetic children were wanting. There is nothing to record that it was not so. P. White and Joslin found

that out of 87 diabetic children, who fell ill before the discovery of insulin and lived till the year 1931, there were 19 cases (22 per cent) of complication from the diseases of the vessels and two suffered from diabetic cataract.

From this it is evident that the complications which were caused by diabetes were rarely observed in the pre-insulin era in young individuals—such as pyorrhœa alveolaris, pyoderma, etc. It may be that the children did not notice the onset of these complications.

The occurrence of arterio-sclerosis among diabetic patients in comparison with non-diabetic patients is greater in patients of middle and higher ages, and as already said, specially in insulin resistant cases in which premature vascularity and hypertony coexist.

The question whether the tendency of diabetic patients to premature hypertony or arterio-sclerosis or both has changed after the discovery of insulin cannot yet be definitely answered. It is certain that the danger of arterio-sclerosis continues to be great and increases as the age advances. In spite of treatment with insulin death from arterio-sclerosis takes the first place.

Nevertheless, on the contrary we can also assert with confidence that insulin has brought great advantages for the treatment of these complications: specially gangrene which in the majority of cases heals under protection and gives better chances than when an operation was necessary. Joslin also affirms that now gangrene has not the same sad outlook with careful insulin treatment that it had in the pre-insulin days.

It is also important to note that in the case of kidney sclerosis and of essential hypertony we can guide the course of treatment in the diabetics as we can in the non-diabetic cases. I do not agree with those authors who state that angina pectoris is a contraindication for treatment with insulin. Quite on the contrary I have experience that in such cases we are able to nourish the diseased heart muscles by insulin treatment much better and therefore with greater success.

Artificial Pneumothorax for the Relief of Acute Pleural Pain

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(Abstracted from the *Lancet*, Vol. II, 7th December, 1935, p. 1280)

SYMPTOMATIC therapy, so often a *faute-de-mieux* resource, acquires a biological significance approaching that of specific therapy, when, by increasing subjective comfort it removes, in addition, a pathogenic factor of potential danger to life. This generalization is aptly exemplified by the successful treatment of pleural pain. In the young and robust, the pain of acute pleural inflammation, because of its agonizing character, demands relief primarily on grounds of humanity. In the middle-aged or elderly, however, the onus of therapeutic responsibility is greatly augmented by the probable occurrence of the serious results which commonly follow upon failure to confer subjective relief; for in such patients myocardial failure and death may be sequelæ of the restlessness, insomnia, and anoxæmia occasioned by the respiratory pain, whilst the shallow, pain-inhibited respiratory excursion produces a varying degree of pulmonary basal atelectasis, which is the prelude to pneumonic infection and its satellite toxæmia with a predilection for the myocardium and the medullary centres.

Ideally, rational symptomatic therapy should achieve alleviation of a symptom by nullification or attenuation of the physio-pathological mechanism basic in its production. Scientific accuracy of this order cannot be claimed in regard to the symptom of pleural pain; neither the popular theory of friction between inflamed serous surfaces, nor Bray's concept of parietal pleural elastic tension, is universally applicable. But there remains the universally accepted clinical observation

that separation of the visceral and parietal pleural layers, whether by fluid or by air, results, without exception, in the disappearance of the pain of acute pleurisy. The methods generally adopted to relieve pleural pain are (1) strapping the affected hemithorax, (2) the application of counter-irritants, and (3) the exhibition of narcotic-analgesic drugs of the opium or barbiturate group. Attempted immobilization by strapping is only partially effective, and has the disadvantage that it favours the production of atelectasis; it also hampers consistent clinical and radiological examination. The application of counter-irritants results chiefly in the greasy discomfort of the clinician in charge of the case. The exhibition of narcotic-analgesic drugs is indictable on their inefficacy except in doses capable of inducing cardiomedullary depression which expedites the initiation of anoxæmia, atelectasis, and their attendant ills.

Because of its acknowledgedly complete efficacy in relieving pleural pain, separation of the pleural layers, as by an artificial pneumothorax, seems to be the most rational mode of therapy; its employment, though generally recognized in textbooks, is mentioned by them only in terms of curt dismissal. The risk of secondary pleural infection, of causing or increasing myocardial distress, and of superimposing the dangers inherent in the induction of pneumothorax—such as pleural shock and air embolism—appear to be the reasons underlying this attitude. They are more theoretical than experimental, and critical examination reveals them as bogies with a very infrequent incidence and therefore of insignificant import when balanced against the prophylactic value of efficiently abolishing the anguish of respiratory pain with its clinical consequences.

Comment.—The two case-histories reported (not included in this abstract) have many common features. In each case the patient was elderly and had developed an atelectatic pneumonia because of the shallow breathing necessitated by the pain of acute pleurisy coupled with compulsory adoption of the supine posture; in one case the correctness of the diagnosis was supported radiologically; in both cases the anoxæmia consequent upon shallow breathing and partial pulmonary atelectasis, added to the toxæmia of secondary pneumonic infection, compelled a prognosis of death from cardiomedullary depression. But in both cases the induction of a shallow pneumothorax produced a dramatic metamorphosis of the clinical and prognostic picture, by its relief of respiratory pain, and so of the anoxæmia and atelectasis; moreover, in each case the amount of air sufficient to give relief was too small (250 c.cm.) to be capable of causing myocardial embarrassment. The employment of artificial pneumothorax for acute dry pleurisy has theoretical sanction because of its accepted efficacy in removing the respiratory pain, especially since it thus minimizes the possible sequential dangers facing the patient. The two cases detailed show that this theoretical sanction is supportable by practical experience.

The general circumstances indicating the therapeutic employment of pneumothorax for pleural pain have been considered. In post-operative cases in which an abdominally initiated diaphragmatic paralysis enhances pulmonary basal atelectasis its value seems worthy of further research. Coghlan in this country and many foreign observers have advocated lung collapse for the treatment of lobar pneumonia; but despite the striking support given to them by the experimental studies of Lieberman and Leopold their advocacy has not found general favour, chiefly because of a theory based on clinical timidity. Whatever the theoretical objections to the induction of major lung collapse in lobar pneumonia, there can be few or none to a consideration of the pain-removing, comfort-giving injection of the innocuously small amount of air necessary to produce pleural separation in those early days of the disease in which the ultimate prognosis is influenced by the degree of general and myocardial exhaustion to which the patient is subjected.

SUMMARY

1. The pain of acute dry pleurisy demands removal in young patients on humane grounds; in the elderly this is imperative as a prophylactic measure against the occurrence of anoxæmia and atelectatic pneumonia which is so often fatal.
2. The therapeutic methods in general use are either only very partially effective or dangerous.
3. The induction of a shallow pneumothorax invariably relieves pleural pain and so removes anoxæmia and atelectasis. The amount of injected air necessary is so small as to be quite harmless.
4. Two cases are detailed in which atelectatic pneumonia and anoxæmia, secondary to pleural pain, suggested a fatal prognosis. Dramatic recovery followed the induction of an analgesic pneumothorax.
5. The indications for the employment of pneumothorax to relieve acute pleural pain are discussed.

Tachycardia

By C. E. K. HERAPATH, M.C., M.D.

(From the *Medical Press and Circular*, Vol. CXCI, 6th November, 1935, p. 406)

TACHYCARDIA is not a disease, but a symptom. In the majority of cases it is a symptom of some alteration of function which calls for an increase of the speed of the circulation. In trained athletes this can be brought about by an increase of the output of the heart per beat; but in the ordinary individual there is an increase of the rate per minute, that is, an increase of the rate of the heart. In a few instances tachycardia is a symptom of some derangement of the heart itself, chiefly some abnormal rhythm. Physiologically the quicker the heart beats the less forcible are the contractions, but some tachycardias are associated with an augmentation or increase in force of the contractions; these cases are not caused by heart disease. Thus the tachycardias may be divided into (1) extra-cardiac cases; (2) cardiac cases.

What are the causes of increase in the rate of the heart? They are very numerous. Anything which stimulates the action of the sympathetic nervous system causes an increase of the pulse rate: thus exercise, emotion, either fear, anger, excitement, or concentrated mental effort, all call for increased outpouring of adrenalin and cause an increase in rate. In the same way fever, increasing metabolism, demands more blood to be supplied to the tissues and thereby calls for an increase in rate of the heart, but we must remember that the morbid process producing the fever may have a toxic effect on the cardiac muscle, and some of the increase in rate may be due to this cause; one must therefore be on the look out for a tachycardia which seems to be in excess of what one would expect with a certain temperature. A good example of this may be seen in lobar pneumonia, where a heart rate of over 120 per minute is a sign of bad omen.

Functional nerve disease is a very common cause of tachycardia, and one which is often very puzzling to the practitioner, but if the individual be considered instead of the heart, other signs will be found which point to the nervous system.

On examination of the heart one finds a widespread cardiac impulse, but the maximum will be found well internal to the mid-clavicular line; a functional tachycardia is usually associated with a small heart. There may be a systolic murmur at the apex but we must be shy of such a murmur unless there be cardiac enlargement. One usually finds that the maximum sound of the murmur is internal to the apex beat, and it is not conducted outwards towards the axilla. It may disappear when one lies the patient down. These little differences show that it is not an organic murmur and is not a sign of valvular disease. Sometimes a murmur is heard only during inspiration and if the breath be held in full inspiration, it disappears. This is a cardio-pulmonary murmur which is caused by a small portion

of lung being compressed by the heart, and some air is expressed every time the heart contracts, making a noise very much the same as a murmur. These cases often complain of a stabbing pain or a dull ache over the whole precordium, and in some cases there may be pain over the heart associated with a pain down the left arm, which makes one consider the diagnosis of angina pectoris. On further inquiry one finds that the pain is not in any way associated with exercise, but is more often brought on by excitement and very frequently occurs in the middle of the night. Such symptoms are mostly met with in young people who are not old enough for angina, for the latter disease does not often arise till middle age has been reached. The heart rate in these functional cases may be anything from 90 to 140, or in a few cases 160, per minute, and it is always regular if the rate is high. On lying them down some slowing is always found; occasionally the rate is markedly slowed and at this time premature contractions or extrasystoles are very likely to occur. On further examination one finds that the arteries are not thickened, but the blood pressure may be on the high side, due to the increase in rate. There will be no albumin in the urine.

These findings suggest that there is no disease in the heart, for even in the presence of shortness of breath and tachycardia, to diagnose heart disease one should find some cardiac enlargement, some definite valvular murmur, some thickening of the arteries or some slight signs of failure such as the veins in the neck standing out and not emptying during diastole when the patient is in the semi-prone position, or some oedema of the feet in the evenings.

If the history of such a case be taken carefully the diagnosis is easy; one finds that they are nervous individuals, frightened of traffic or of crowded places; they sleep badly and sweat a lot, they are irritable and have lost the power of mental concentration; if the pulse be quick they complain of shortness of breath, palpitation and pain in the region of the heart; they show a coarse tremor in the hands and often the tongue, and the knee jerks are exaggerated and often of a multiple nature—a tap may send the whole leg into clonus. The symptoms they complain of are innumerable, and their manner shows an introspective nature; these two facts should always suggest some functional nerve complaint.

These cases are usually convinced that they have heart disease; the rate of the heart, the shortness of breath and the pain all help to convince them of the gravity of their disease, and to the lay mind heart disease means sudden death, or at least a speedy end.

These are the cases we saw so many of at the end of the war, and even now in civil life there are a great number of them, mostly in women, though one sees many such cases in men. Life at present is a very strenuous affair, employment is so precarious and pleasures are taken so seriously that it is easily seen how the nervous system is overtaxed. The first rule of treatment is to try and convince them that the heart is not diseased and is not really at fault; until this has been accomplished no treatment is of any avail, for the idea of heart disease only makes them more anxious and aggravates the symptoms, so that they are in a vicious circle. If they cannot be made to see this clearly it is wise to send them for a second opinion. Confirmation of the diagnosis will often help them to realize that their nervous systems are really at fault.

This disease is often met with after an attack of influenza, which at times has a great depressing action on the nervous system; and it commonly appears after a long and debilitating illness.

The next cause of extra-cardiac tachycardia to be considered is due to thyroid disease, for in the early stages it is very similar to the previous condition. In both there is a normal heart with tachycardia, for although heart disease occurs in the later stages of Graves' disease, the picture will then be so plain that mistakes will not occur. There are little points in the history which will serve to separate the two conditions.

Graves' disease is associated with an augmentation of the beat as well as tachycardia; they complain of violent beating, and cases of this disease are not nearly so often accompanied by pain over the heart. A history of unexplainable attacks of diarrhoea are suggestive of thyroid disease. Wasting is an important symptom, but so it may be in the nervous tachycardia; but the difference is that in Graves' disease the wasting is progressive in spite of the patient eating very good meals, while the nervous cases do not waste unless they do not eat well. The tremor of thyroid disease is very fine and quick, and is best brought out by extending the arms to the full extent with the fingers spread out. The actions and speech of the goitre patients are quick, impulsive and excited, and they are very apt to weep at one moment and laugh at the next moment; another peculiarity of these cases is that they enjoy the coldest weather and never feel the cold, whereas hot weather always makes them worse. Slight enlargement of the thyroid does not help, for the nervous tachycardias are often accompanied with some slight enlargement.

Tachycardia in cardiac disease is mostly caused by the inception of some abnormal rhythm such as auricular fibrillation, auricular flutter or paroxysmal tachycardia, although it may be seen in cases of cardiac failure, where it is the last effort of the heart to keep the circulation up to normal rate. These cases are obvious and do not really need mention. One also sees tachycardia with valvular lesions fairly frequently, but the history shows instability of the nervous system, and these cases are a mixture of organic disease with functional nervous tachycardia superimposed. I often tell my students that the chief use of a cardiologist is to remove the functional element from these cases, when the patients improve to such an extent that they often think that one has cured them of heart disease.

TACHYCARDIA WITH ABNORMAL RHYTHMS

Auricular fibrillation is often seen in rheumatic hearts, thyroid disease, and in individuals who are past middle life and who have arterial disease. It is a condition of inco-ordination of the auricular contraction, and the irregularity is passed, by means of the bundle of His, to the ventricles. The irregularity is one of both rhythm and force, so that no two heart cycles are of the same length, nor is the pressure of the same strength. Though this condition may be met with in slow hearts, the usual type is a tachycardia of anything from 120 to 140 or more. Many of the smaller beats do not reach the pulse at the wrist, so that the pulse is much slower than the real heart rate. This condition is termed pulse deficiency and is useful to confirm the diagnosis. Of course, none of the beats which do not reach the wrist do anything towards helping the circulation, and consequently this condition is very often associated with congestive heart failure. If the heart rate be slowed by digitalis, the ventricles are able to recover their tone and are quite able to carry on the circulation, because when slowing takes place each beat is much stronger, even though the irregularity still remains.

In auricular flutter there is little or no irregularity, but the auricles contract at a rate approximating 300 per minute. This rate is much faster than the average bundle of His can deal with, and one usually finds that every other beat is blocked by the bundle and the pulse rate is about 150 per minute. Sometimes only one beat in four comes through to the ventricles, and the pulse rate is about 75 per minute. Occasionally it is found that on exercise the ventricular rate becomes equal to the auricular rate. I have one electrocardiogram of such a case where on exercise the ventricular rate was 268 per minute, but after a few minutes this was halved to 134, much to the relief of the patient.

This makes it possible to sometimes diagnose the condition clinically, for if a case has a rate of 150, which practically never varies unless it jumps to 75 or to 300, then one would be justified in diagnosing auricular flutter. There is only one other condition where

halving of the pulse rate can occur, and this is where there is a premature beat or extrasystole at every alternate beat, which is not always present; but in this case the sound of the two beats should be heard at the heart, and also premature beats do not usually occur when the ventricles are as quick as 150. It is also sometimes possible to see that the jugular bulb is beating at a rate twice as fast as the ventricular rate.

Paroxysmal tachycardias are rhythmical series of beats which usually approximate to 180 to 200 per minute. They may arise from the auricle, ventricle or from the bundle of His. They are thought to occur in the same way as a premature beat, except that whereas in the premature beat there is only one contraction, in the tachycardia there is a series of them following one after the other. The cause of this might be an irritable focus, but the actual ætiology is unknown.

The length of the attacks varies very much: some may stop in a few minutes, others may go on for hours or days. They usually start early in life, about the age of fifteen to twenty, though sometimes one sees the first attack much later, and they may occur at irregular periods all their lives. In a young healthy person they appear to do little harm, and as soon as the paroxysm stops they carry on with what they were doing when it began; but as life goes on and the myocardium is not so healthy, the attacks upset the patient and may even bring on heart failure of the congestive type, and it may take some time for the patient to recover from them. It might be thought that the attacks will in time become more lengthy, but this does not often happen. The length of the

attacks seem to vary from time to time in quite a haphazard manner. The diagnosis between auricular, ventricular or nodal attacks is of little importance except from a scientific point of view, and can only be distinguished by means of an electrocardiogram; clinically it is not possible to give any opinion. The prognosis is important and a true estimate can only be given by judging the effect of the attack upon the patient, especially noticing the occurrence of cyanosis, dyspnoea, enlargement of the liver or oedema of the ankles. If any of these be present, the prognosis must be guarded, but if the attack causes no sign of failure the prognosis is good. I remember one case where an attack, which was, as far as one could find out, the first one, did not stop, and after six weeks he died of heart failure; this, however, is a very rare occurrence. Various methods of stopping these attacks are mentioned in books, but in reality there is no sure and certain method. Every patient has a story of how he stopped the last attack, but the real truth is that the attack happened to stop when he was doing something, and he naturally thought that this stopped it. One case informed me that the attacks always went on till he vomited, but that this stopped it. I happened later to see him in an attack; he vomited, but the attack still went on. In the same way nothing is known as to what brings on the paroxysm: some blame an excessive exertion, some blame overloading of the stomach, but in reality they may come on at any time, and I have known them to start during sleep.

The diagnosis is very simple: if the tachycardia comes on all of a sudden and stops as suddenly, a diagnosis of paroxysmal tachycardia may confidently be made provided the rate be 180 per minute or more.

Reviews

MODERN TREATMENT IN GENERAL PRACTICE.
VOLUME II.—Edited by C. P. G. Wakeley, D.Sc.,
F.R.C.S., F.R.S.E. Messrs. Butterworth and Com-
pany (India) Limited, Calcutta, Bombay and
Madras. Pp. viii plus 382. Illustrated. Price,
Rs. 7-14

THE *Medical Press and Circular* is in many ways an ideal journal for the general practitioner. There are few numbers of the *Gazette* in which we have not included in our 'current topics' section a lengthy extract from this useful paper. A few years ago the editor started a series entitled 'Modern Treatment in General Practice'; these were deservedly popular, and when the first series of these articles was published in book form a reprint was demanded within six months. The book under review contains a second series of articles on the same lines.

There are forty chapters written by thirty-nine contributors on subjects that are all of great interest to the practitioner; they are written primarily from the point of view of treatment but naturally diagnosis and pathology are considered in so far as they influence the treatment or explain its rationale. The contributors are all recognized authorities on their subjects. The articles are not arranged in any special order but are more or less alternately on medical and surgical subjects. Most of the articles deal with the treatment of some specific condition, such as appendicitis in children and fractures of the patella, but there are also more general chapters, such as on the value of biochemistry—this deals mainly with dietetics—and on physical treatment in general practice.

The first article, by Sir William Wilcox, on gastric and duodenal ulcer was, in the opinion of the reviewer, disappointing, but this was the only one that he found so. In this article the indications given for medical treatment as against surgical are the ones now generally

accepted but the details given for the dietetic treatment are too sketchy and the indications for the adoption of the various procedures suggested are not precise enough; the reviewer has had no experience of the duodenal tube method of treatment but finds here little encouragement to try it, although the writer expresses himself in favour of that form of treatment.

The article on constipation—a very difficult subject—was rational and very helpful. Great emphasis is laid on habit; ninety per cent of constipation is probably due to the failure to adopt good habits in this matter in childhood and early youth. The writer does not tirade against purgatives, as many writers on this subject do, but points out their uses and issues warnings against their abuses.

Pneumonia is also dealt with in a very satisfactory manner. There is now no doubt at all about the value of serum in the treatment of this disease. This writer says that it is useless after the fifth day [but it is of little value after the third day]. There is also no doubt about the limitations of serum treatment. In type I pneumonia it will reduce the death rate from 14.7 to 9.8 per cent and in type II from 26.2 to 20.1 per cent; that is to say it will save the lives of 5 or 6 people in each hundred persons suffering from pneumonia—of either of these types—that were otherwise doomed to die. Though this is a definite result, it is not a dramatic one, and the advantages of this treatment might easily escape the notice of the doctor who has a limited experience in this disease; he should not therefore allow himself to be influenced too much by his own experience. On the other hand, to use expensive serum indiscriminately in all cases of pneumonia at any stage of the disease in this country where types I and II are less common than in England and America is obviously unjustifiable.

The second volume of articles on treatment is quite up to the standard of the first and to say this is to

accord it high praise. The price is a very reasonable one.

L. E. N.

RECENT ADVANCES IN MEDICINE: CLINICAL LABORATORY THERAPEUTIC.—By G. E. Beaumont, M.A., D.M. (Oxon.), F.R.C.P., D.P.H. (Lond.), and E. C. Dodds, M.V.O., D.Sc., Ph.D., M.D., F.R.C.P. Eighth Edition. 1936. J. and A. Churchill Limited, London. Pp. xvii plus 450, with 46 illustrations. Price, 12s. 6d.

We have begun to look for a new edition of this the most popular book of that very popular series, 'Recent Advances', almost annually. This is in fact the eighth edition since 1924.

That there has been some revision in nearly every section is a tribute to the present generation of physicians and research workers; it is noticeable that most advances have been made with the aid of biochemical investigation. Some of the most striking have been made in our knowledge of hormones and ductless glands, and the section dealing with this subject is practically a new one. Vitamins are included in the same chapter and the information on these important accessory food substances has been brought up to date; this is mainly in our knowledge of their chemistry and there is little new about the clinical application of this knowledge. There is a table showing what is known about the six different substances constituting the vitamin-B complex; B3, B4, B5 and B6 are not yet as clearly defined as B1 and B2, and they appear to exhibit a tendency to change places with one another.

The section on anæmia has been extensively rearranged and new matter added. There is still no reference to the packed-cell method of estimating cell volume; it is difficult to see why this method fails to gain popularity in England. To the section on the stomach, the alcohol test meal method has been added but the ordinary, Rehfuß, method is still retained. The histamin method is also described. In the reviewer's experience the alcohol method is far easier and is distinctly more popular with patients. The results obtained are not exactly comparable to those with the gruel meal and for this reason it is a pity that some normal curves are not given.

A few omissions have been necessitated in order to prevent a serious increase in size of the volume, but these have been rather of the nature of compressions than actual omissions. The very excellent sections on kidney function and basal metabolism still remain, but with slight additions in the latter instance. The ketogenic diet is now increased to a ratio of 6 to 1 ketogenic to non-ketogenic substances; the reduction of the carbohydrates to 4 grammes a day seems rather a drastic procedure. There is no mention of mandelic acid in the treatment of *Bacillus coli* infections. Another omission is the use of histidine in the treatment of gastric and duodenal ulcer. But perhaps neither of these can yet be classed as established advances.

This edition deserves to be as popular as the previous ones.

L. E. N.

PROGNOSIS. VOLUME I. 1935. Published by the Lancet Limited (7, Adam Street, Adelphi), London. Pp. x plus 372. Obtainable from Messrs. Butterworth and Company (India) Limited (Sole agents in India and the East), Calcutta. Price, Rs. 7-12

It has been said of the trio, diagnosis, treatment and prognosis, that the most important is diagnosis, that the next most important is diagnosis, and that after this comes diagnosis. This may be true, but much is written about diagnosis, even more is written about treatment, and very little about prognosis. One of the reasons for this is that there is very little accurate information on the subject. No definite system of following up cases was practised even in the big hospitals in London until a few years ago, and

in many other hospitals this important source of information is still entirely neglected. The follow-up system is as essential a corrective to the physician who has such supreme faith in his treatment that he counts all patients as cured if they do not return to him for further treatment, as the post-mortem room is to the physician who has the same faith in his powers of diagnosis.

Prognosis is not simply a matter of statistics, though they form a very excellent basis. The patient does not want to be told that 50 per cent of sufferers from his disease recover completely, 30 per cent partially, and 20 per cent die; he will probably be egotistical enough to wish to know into which group he himself is likely to fall. There are many factors to be taken into consideration and it is only by experience that each can be given its correct value. Personal experience may be limited, and therefore the carefully weighed opinion of one who has had special experience will be of great assistance in this difficult matter of prognosis.

The articles that appear in this book have been published in the *Lancet* at various times. The reviewer has read them with interest from time to time, but in book form they make a much stronger appeal. They are essentially the type of article that one wants to refer to when the occasion arises, rather than to commit to memory, though of course a useful impression is left after reading them through once.

It is not necessary to discuss the individual contributions; they are all by authorities on the subject on which they write. It is interesting to read that the subjects were chosen by the contributors themselves, and were not suggested by the Editor; this is an important point, as they will obviously have chosen those subjects on which they feel most competent to express an opinion, and will not be simply written to order, as sometimes happens.

The short opening chapter on general principles by Robert Hutchison is particularly good and will bear reading more than once; every word has been well considered.

Congratulations are due to the publishers on the format of the book; the title page makes a particular appeal to the reviewer. It is a book that we can recommend to the practitioner for an important place on his reference shelf.

L. E. N.

RECENT ADVANCES IN LARYNGOLOGY AND OTOTOLOGY.—By R. Scott Stevenson, M.D., Ch.B., F.R.C.S. (Edin.). 1935. J. and A. Churchill Limited, London. Pp. x plus 346, with 128 illustrations including 13 plates. Price, 15s.

MR. STEVENSON has succeeded in producing a very useful book especially for post-graduates and for specialists both senior and junior.

The general practitioner will also find in it very useful and practical information, for instance in the chapter on conservative treatment of middle-ear suppuration.

The opening chapter deals with the tonsil problem. This time-worn subject he deals with fairly and without personal bias. He then deals with malignant disease of the pharynx.

He describes Coutard's deep x-ray technique and Berven and Cade's radium technique. The chapter on agranulocytic angina is interesting and up to date. The chapter on the mechanism of the larynx and voice is derived chiefly from the masterly work of Negus. Then he deals with cancer of the larynx, illustrating it with photographs of Broders' grading of cancers and of operations on the larynx.

There is a very useful analysis of the work of St. Clair Thomson and Colledge, and Harmer's radium treatment and deep therapy. Bronchoscopy and œsophagoscopy are reviewed in their relation to general medicine. Intranasal and external operations on the nasal sinuses are described fully and the order of operation indicated.

The section on otology is very full and includes a consideration of the Wever and Bray phenomenon with a comparison of the hearing tests with tuning fork and audio-meter.

The chapters on recent work on otosclerosis and Meniere's disease are very interesting. Neumann's method of dealing with meningitis of otitic origin gives the best chance of recovery.

The author is to be congratulated on producing an excellent review of the whole subject in the short space of some 350 pages. There is a very complete list of references at the end of each chapter.

The publishers are also to be congratulated for the book is well produced and

H. S. C.

AN EPITOME OF THE LABORATORY DIAGNOSIS AND TREATMENT OF TROPICAL DISEASES.—

By Horace M. Shelley, F.R.F.P.S., M.R.C.S., L.R.C.P., D.T.M. & H. (Eng.). 1936. (Pocket Monographs on Practical Medicine). John Bale, Sons and Danielsson, Limited, London. Pp. xii plus 81. Illustrated. Price, 2s. 6d.

It is claimed in the preface that this book is written to provide the 'busy practitioner' with concise information on the laboratory diagnosis and treatment of tropical diseases. For the purpose of providing the 'busy practitioner' in Africa with all he need know about tropical diseases that occur mainly in India, and conversely of providing the 'busy practitioner' in this country with necessary information on African diseases, the book should prove adequate; but we do not feel that the 'busy practitioner' in either country would remain busy if he had to rely entirely on the information given in this book for the treatment of his patients suffering from the local diseases. On the other hand, it is probable that it would provide the busy examiner with sufficient information to satisfy a busy examiner—in most temperate climates.

Under the diagnosis of relapsing fever we read—'The treponema itself is a coarse type of spirochæte, having seven to fourteen curves, and extending to a maximum length of 20 microns. It is very slender and has such a characteristic appearance that it cannot be easily mistaken'. This last sentence may be the truth, but we do not feel that the author has conveyed to us an entirely unmistakable impression of what this coarse slender spirochæte looks like. Nor are we assisted by the crude line drawing.

The technique for 'blood counts' is very inadequate and one wonders whether it was worth including at all. The Tallqvist method for estimation of hæmoglobin is the only one mentioned, and the normal standards are obviously copied from English textbooks.

Under infective jaundice it is stated that the 'organism is found in the blood and urine in the first three or four days of the disease'. There is no mention of berberine sulphate in the treatment of oriental sore, nor of Frei's test in the diagnosis of climatic bubo. The dosage of neostibosan given on page 20 does not coincide with that given on page 75. A dose of 0.02 grammes of plasmoquine four times a day is advocated.

The author considers it 'rather farcical to rid a native patient of his hookworms by carefully controlled hospital treatment knowing that he will be reinfested', and considers that 'he should be instructed how to avoid becoming reinfested'. We agree with this last remark, but we think that the author might have let us into the secret too. Tetrachlorethylene is not mentioned, and, though the dangers of carbon tetrachloride are emphasized, there is no mention of the special danger in alcoholics.

Nevertheless, there is much accurate information in the book, quite sufficient, as we have said, to satisfy many examiners.

L. E. N.

GREAT DOCTORS OF THE NINETEENTH CENTURY.—By Sir William Hale-White, K.B.E., M.D., LL.D. (Hon.), F.R.C.P. 1935. Edward Arnold and Company, London. Pp. vii plus 325. Price, 15s.

ENGLISH literature is by no means rich in medical biographies and any worthy additions to the historical shelves of our libraries are very welcome indeed. These seventeen essays on distinguished doctors of the last century are important from an historical point of view, and they also form very good reading matter.

The biographies are peculiarly satisfying, but it is hard to say what is the particular quality that makes them so. We are told a little about the forebears of each of these great men; although in some cases this amounts to little more than the classical opening of the 'poor but honest parents' type, it is sufficient to create a picture of their home surroundings and to allow one to trace the effect on the later lives of the subjects. Then an account is given of their early struggles, more often for a livelihood than for recognition. There is little suggestion that any of these men felt that they were personally endowed with the divine spark; most of them had their enemies and their quarrels, but, with one outstanding exception, they do not seem to have suffered delusions of persecution. Some might think that the book contains too many references to salary and earnings; but the correlation between these and opportunity and experience is such a close one that they are crucial factors in the lives of most medical men; great medical discoveries cannot be made in a garret.

Contrasts between the different lives is interesting. When Simpson died every shop in Edinburgh closed for the day and the Queen sent messages of condolence. Addison's death was not even marked by an obituary notice in the *Lancet* or *British Medical Journal*. Yet to-day Addison's name is the more familiar.

The first chapter is on Jenner, the last on Ross. The author shows Ross as a dilettante littérateur and minor poet who made a short but brilliant essay into medical research and then retired (not from salaried appointments, but from active medical research) and wrote about it for the rest of his life. In 1895 Ross was writing books and poetry when he got the idea from Manson that mosquitoes might transmit malaria. He returned to India, proved the theory, and left India again within four years. 'After he left his official post in India he did no original work, saying he had lost heart for it, because of early opposition, and because of the attempts to deprive him of priority'. This is perhaps hardly doing justice to Ross.

Sir William is not a writer of beautiful and smooth English. He tends to use too many short staccato sentences—but for the medical reader and especially for the reader in India this is an error on the right side—and he is careless with his pronouns. The early misgivings that the reviewer entertained—on reading the opening sentence of the preface—were mercifully not fulfilled. Sir William has made an important addition to literature of medical history and we can thoroughly recommend the book to both medical and other readers.

L. E. N.

FOR AND AGAINST DOCTORS: AN ANTHOLOGY.—Compiled by R. Hutchison and G. M. Wauchop. 1935. Edward Arnold and Company, London. Pp. 168. Price, 7s. 6d.

It is particularly annoying to read a book almost to the end, to pause and decide what you will say in your review, and then to find that this has already been said in the last two pages of the book in a 'retrospect'. Here is quoted the remark of an American writer that 'all the real, solid, elemental jokes against doctors were uttered some one or two thousand years ago'. The remark is also true of the criticism and abuse of doctors. Perhaps the most striking thing about this earlier criticism was its vulgarity—viewed from a

present-day standpoint—and the singular absence of wit. 'Who has a physician has an executioner' and 'The best of doctors is ripe for hell' strike one as being abuse without any subtlety.

The Emperor Hadrian directed that the words 'A multitude of physicians have destroyed me' should be inscribed on his tomb; to this we should like to have added *Punch's* remark, 'One physician is better than two, but three are fatal'. Both might well be remembered in this country where it is fashionable to call in a series of half a dozen consultants, to get prescriptions from each, and then to use none of them—perhaps better for the patient than giving them all. There is another remark, which, though made in the 13th Century in England is applicable to-day in India—'Medical men are ignorant of simple medicine, and at the mercy of uneducated apothecaries'.

Very much more welcome is reasoned criticism of the profession. Francis Bacon supplied plenty of this. 'For in all times, in the opinion of the multitude, witches and old women and impostors have had a competition with physicians. And what followeth? Even this, that physicians say to themselves, as Solomon expresseth it on a higher occasion, 'If it befalleth me as it befalleth to the fools, why should I labour to be more wise?' Ninety per cent of the defects in the profession can be traced to this attitude of mind, which should be guarded against at all costs, but it is the quacks within the profession that set the bad example to the young practitioner to-day.

We are able to stand up against the unjust criticism of our enemies, but save us from our friends! Ruskin wrote 'if they are brave and well educated, the entire object of their lives is not fees. They, on the whole, desire to cure the sick; and—if they are good doctors, and the choice were fairly put to them—would rather cure their patient, and lose their fee, than kill him, and get it'. Or, in other words that most—but not all, mark you—doctors would hesitate to murder their grandmothers for the gold in their false teeth. High praise indeed!

On the other hand, most of us will feel a little self-conscious on reading Stephen Paget's opinion of our profession—'If a doctor's life may not be a divine vocation, then no life is a vocation, and nothing is divine'. It is, however, an ideal up to which we might all attempt to live.

We can recommend this book to all doctors, and to their patients and friends as a suitable and inexpensive present to give to a doctor.

L. E. N.

OBSTETRICAL PRACTICE.—By A. C. Beck, M.D. 1935. Baillière, Tindall and Cox, London. Pp. x plus 702, with 1,043 figures. Price, 32s. 6d.

THE first impression experienced by many medical men on seeing a well-got-up and profusely illustrated new textbook is one of suspicion; there have been too many such whose excellence lay in their get-up rather than in their material. It took a very short examination of Beck's *Obstetrical Practice* to dispel this suspicion, and longer study changed it into admiration. It is a new textbook which should set up a standard for others, especially in those sections dealing with the various mechanisms of labour.

The author, who is professor of obstetrics and gynaecology in the Long Island College of Medicine, has a wide experience in teaching post-graduate students, and he believes that most of their difficulties in obstetric deliveries have been due to their lack of knowledge of the mechanism of labour. Accordingly he devotes more than a third of this large book, and more than 600 illustrations, to this subject. After a good description of the powers, the passages, and the passenger, each accepted mechanism and its management is described separately, and illustrated by four series of drawings. Each series shows the course of labour as seen from one standpoint. It is chiefly through these illustrations, and only to a minor extent

through the text, that the author seeks to teach this subject; their number may sound excessive, but there are none which do not illustrate a point well, or with which the reviewer would dispense. It would be a poor student who could study these chapters seriously and still remain deficient in his knowledge of the mechanism of labour.

Another subject to which the author devotes more than usual attention is the medical and surgical complications of pregnancy. They are dealt with in eight sections, to each of which is attached a bibliography of some twenty to thirty references, and many complications not normally referred to in a textbook are described. In this chapter, and this chapter alone, there appears to be a lack of balance. The average student would prefer that some of the common complications were more fully dealt with, even if it meant the exclusion of reference to some of the more rare ones. The practitioner in India is used to seeing his bug-bear, anaemia, ignored, so it is a pleasure to see it recognized here, even though it is only to be briefly and not too accurately dismissed. But surely the aetiology, pathology, symptomatology and treatment of pyelitis deserve more than a single page!

The physiology and pathology of the foetus, pregnancy, and the puerperium receive as good treatment as does the mechanism of labour, though the author relies more on the written word than on illustrations. His writing is avowedly for the learner and not for the expert, so that a rather dogmatic presentation of his own opinion is given, to the exclusion of conflicting theories. This makes for clarity and simplicity, whilst its tendency to produce a narrow-minded outlook in the student is fully offset by the short bibliography at the end of each chapter, which is designed to help him to go more deeply into the subject.

The book bears, throughout, the imprint of a single author, which gives it a great advantage in continuity of thought and method over most complications by bands of experts. The reviewer read it with interest and advantage from cover to cover, and found so few minor points to criticize that to mention any of them would seem to overweight the review with criticism. It should at once be recognized as being in the front rank of textbooks of obstetric practice for post-graduate as well as under-graduate students.

G. M.

COMMON SKIN DISEASES.—By A. C. Roxburgh, M.A., M.D., B.Ch. (Cantab.), F.R.C.P. (Lond.). Third Edition. (General Practice Series.) 1936. H. K. Lewis and Company Limited, London. Pp. xxxi plus 377, with 8 plates in colour and 139 text illustrations. Price, 15s.

THIS book was first published in October 1932, and that it was deservedly appreciated was shown by the fact that a second edition was needed by July 1934, this edition was even more quickly exhausted, for the present volume, the third edition, appeared in January last.

The book is practically the same size as the former editions but a few paragraphs have been added and a little touching-up elsewhere has been done. The illustrations have also been improved by the replacement of eight of the original ones and the addition of eleven others. The author has also found it necessary to give his prescriptions in both the metric and British measures thus showing the book is appreciated outside the English-speaking world.

In our review of the second edition we expressed the hope that the author might gradually increase the size of his book as it appeared an excellent foundation on which to construct a large textbook. He has not done so and on second thoughts we are inclined to agree with him for in this book he has supplied all a general practitioner needs for his occasional dermatological cases, and if the size of the book is increased it will lose one of its most valuable characters. Increase in size would also mean increase in price and

this would remove another of the outstanding characters of the book for we are not acquainted with books in any other branch of medicine which give such good value for the sum of 15 shillings, and in this connection the publishers merit praise as well because this book lacks nothing in quality of production on account of cheapness.

P. A. M.

A SYNOPSIS OF PHYSIOLOGY.—By A. Rendle Short, B.Sc., M.D., F.R.C.S., and C. I. Ham, M.B., B.Ch., F.R.C.S. (Ed.). Second Edition. Edited by C. L. G. Pratt, M.Sc., M.D. 1936. John Wright and Sons, Limited, Bristol. Pp. 312. Illustrated with coloured and other diagrams. Price, 10s. 6d.

THIS is a very handy little book containing up-to-date information on modern physiology within a short compass. The subject-matter has been nicely dealt with and is well arranged. The chapter on chemistry and the tests for detection of the substances of physiological importance have increased its usefulness. The students going up for their university examination will find this book very suitable for general and quick revision of the subject of physiology.

P. D.

THE EXTRA PHARMACOPŒIA OF MARTINDALE AND WESTCOTT. Twentieth Edition. Volume II. 1935. Published by Direction of the Council of the Pharmaceutical Society of Great Britain, The Pharmaceutical Press, London. (23, Bloomsbury Square, W.C. 1). Pp. xxxvi plus 889. Price, 22s. 6d.

IN the twentieth edition of this book, the general arrangement of the subject-matter of the previous editions remains practically unaltered, but in view of the

recent complete revision of the *British Pharmacopœia* and the *British Pharmaceutical Codex*, numerous chapters bearing on scientific progress associated with medicine, chemistry and pharmacy have been added. Scientific papers and abstracts published in various journals have been fully made use of in revising this treatise.

This volume deals chiefly with the analytical, experimental and research work and many other subjects associated with different branches of medicine. The present edition has been to a great extent rewritten. This change was rendered necessary by the increase of knowledge obtained during the last few years. The subject-matter is well reviewed to the minutest detail and the chaff carefully winnowed from the grain.

The section dealing with hormones and glandular products has been very much expanded. The study of the endocrinologic problem from a standpoint of physiology and pathology, as well as therapy, has been very widespread and the growth of this form of therapy has been steady and progressive in all parts of the world. Recent advances with special regard to therapeutics are incorporated in this volume and an account of the methods of standardizing different hormones will be found outlined with transparent clearness. The chapter dealing with hæmatology has been submitted to a detailed examination and the accepted views and methods considered of value to medical practitioners has been well summarized. Some of the older methods of blood analysis have been replaced by less cumbersome modern micro-methods.

In a work that is worthy of so much praise and deserving of so little criticism the function of a reviewer is difficult. The work is remarkable for the manner in which the newest results of research are brought together. We have no doubt that this edition will maintain the prestige which its predecessors have won.

Abstracts from Reports

REPORT ON THE HEALTH OF THE ARMY IN INDIA FOR THE YEAR 1934. VOLUME LXX

NOTES ON DISEASES

Cerebro-spinal meningitis.—Cerebro-spinal meningitis has in recent years been increasing to a marked extent among the civilian population of India. This increase is reflected in the incidence among Indian troops, but among British troops only two cases (one fatal) have occurred.

The incidence has fallen largely on recruits, 18 of the 38 cases among Indian troops falling into this category.

The mortality rate of 1934 was considerably lower than that of previous years. While, no doubt, there are many factors involved in this result, it is not without interest that it coincides with the adoption of a three-times concentrated therapeutic serum (which is the only type now used), and with the more general adoption of the policy of administering this serum intrathecally in daily doses from the earliest possible moment until the issue of the case is beyond doubt. In those cases which recovered (excluding one case—a boy—where treatment was refused by the parents), the average quantity of serum given in each case was 119 c.cm. intrathecally, and 86 c.cm. by other routes.

In one hospital, in addition to this routine treatment, iodine was administered intravenously. Of eight cases so treated only two died. Three of the eight cases were classed as very severe, three as severe, and two as moderately severe, so that the results may be regarded as good. This method of treatment merits, and is receiving, further investigation.

Cysticercosis.—Two cases of this disease were diagnosed in India, one of which was rapidly fatal. Much

attention has been directed to the hygienic control of piggeries and to the examination of pork, in the hope that a decrease in infestation with *T. solium* (40 cases of which occurred among British troops) may lead to a corresponding decrease in cysticercosis. All officers are alive to the importance of this subject, and all known steps for the prevention of the disease are being taken.

Dengue.—The incidence during 1934 is the lowest that has been recorded in the last ten years. As in previous years, the disease is confined mainly to the garrisons of ports.

The incidence of dengue bears a close relationship to that of malaria, in most years the incidence of malaria is approximately ten to twelve times that of dengue.

Sandfly fever.—Research on this subject has suffered an unfortunate check through inability to maintain continuity in the appointment of officers specially selected for the investigation of this disease.

Under the conditions which at present exist in the localities where this fever is most prevalent, it is not practicable to prevent sandflies from breeding. Nor are the climatic conditions in these localities such that the use of small-mesh nets can be advocated. As funds permit, old and unsuitable barracks in certain of these stations are being replaced by buildings of improved construction and design, from which it will be much easier to eliminate sandflies. It is hoped that this measure will give rise to some improvement.

Fevers of the typhus group.—The increased number of cases of fever of the typhus group, which has been reported this year, does not necessarily indicate an increase in the incidence of the disease. It is more probably a sign of the greater interest which is being

taken in this condition and of the improved methods of diagnosis which are available.

Special case sheets have been maintained for all these cases, and an examination of the results of 110 cases among British and Indian troops of all ranks, and their families, reveals various points of interest and importance which have not previously been fully realized.

The Indian form of this disease is commonly known as Indian tick typhus, although this designation has not been used in army nomenclature since 1932. The generally accepted idea was that only one type of the disease existed in the country.

As the result of testing the serum of all cases against standardized suspensions of the 'O' antigen of *B. proteus* X2, XK, and X19, it has been definitely shown that a type of typhus, closely related in its clinical and serological characters to 'scrub typhus' of Malaya, is to be found scattered throughout India. In the period under review this type had a very definite seasonal incidence, the vast majority of cases occurring between the middle of August and the beginning of October—i.e., during the latter portion of the monsoon. The rash in these cases was relatively inconspicuous and disappeared completely in about seven days. There was a well marked rise in agglutinins of the XK type, accompanied by practically no co-agglutinins for X2 and X19. No evidence was forthcoming as to the vector; none of the cases gave any history of tick bite. By analogy, it seems possible that a mite may be responsible.

Another type of the disease, first appearing in July and rising to maximum in December, occurred chiefly in certain districts in the Southern Command. This is undoubtedly the form which has been described as 'Indian tick typhus'. The rash in this type of the disease differs in certain important particulars from that which occurs in XK type. It is much more conspicuous, is generalized in distribution—being present on the palms and soles—and is of prolonged duration, persisting in certain cases for a month or more, the average being from two to three weeks. On the whole, the symptoms are more severe in this than in the XK type. The serological results in these cases are variable; in some, agglutinins for X2 predominate; in others, the balance is in favour of X19. It would appear that this is probably a group response, and that the strain of *B. proteus*, which embodies the main antigen of this virus, has yet to be discovered. In the 1934 series of cases there is no evidence that the patients were bitten by ticks, and the question of the vector must remain an open one, although there are undoubtedly grounds for suspecting the tick. This matter is being investigated. These cases bear a very close resemblance to the Rocky Mountain fever, *Fièvre Boutonneuse*, and African tick-bite fever, differing from the latter two in not showing a primary lesion.

A third type of the disease is found chiefly in the South of India, the majority of cases having occurred this year in Bangalore. Most of the patients were Indians and showed no rash. A transient rash of varied type and distribution appeared in 5 of the 6 British cases. This type had no definite seasonal incidence, but was absent during the hot weather months. The serum in most of the cases agglutinated X19 to a high titre. It is, of course, possible that this type may be merely a variant of the second type, but on the whole there is good reason to regard it as a separate entity, possibly a member of the endemic typhus (flea-borne) sub-group. There is no evidence of either tick or louse transmission. Experiments with rats and rat fleas have, up to date, been negative.

Certain cases have occurred which, in the absence of further information, cannot at present be placed in any of these three groups. Three cases had a fatal termination. It is considered that all of these belonged to the second group.

An interesting point common to cases of all types, and one which explains why the correct diagnosis has

been overlooked in the past, is that many of them show a well-marked rise in agglutinins for one or other of the enteric group organisms. Blood cultures have, of course, been carried out and have given negative results in this respect.

It is proposed to make use of absorption tests to throw further light on the exact nature of these agglutinin reactions against both proteus and enteric strains. A few cases have developed a positive Wassermann reaction which generally subsided to negative during convalescence. These fevers have been almost entirely confined to males. In the series of 110 cases, one, which occurred in a girl aged 10, is the only exception.

Pyrexia of uncertain origin.—The number of cases classified under this diagnosis continues to decrease.

Diphtheria.—Sporadic cases continue to occur, and the figures have remained at a very constant level. There has been no outbreak of an epidemic nature among British troops.

Enteric fevers.—The incidence among British troops has decreased almost by half, reaching a lower level than has ever previously been touched. Among Indian troops the decrease which has been in progress in recent years has been maintained, but this is in no way proportionate to the very marked drop which has occurred among British troops. Deaths have been halved among British troops, and decreased from 23 to 15 among Indian troops.

There has been no epidemic outbreak among the troops, the majority of cases having been sporadic in nature. Occasional groups of two or three cases have occurred denoting a common but transient source of origin. In the examinations of menials which were carried out during the year (10,572 men being examined with a total of 35,895 tests), 7 carriers (six of *B. typhosum*, and one of *B. paratyphosum*) were discovered. The absence of outbreaks bears witness to the fact that the system which is in vogue is producing the desired result.

Dysentery, diarrhoea, colitis and amœbic hepatitis.—The admission ratio is the same as that for 1933. The average constantly sick ratio, the average sick time in days, and the average number of days lost per 1,000 of the strength per annum, all show slight decreases, indicating that the type of case was less severe than in the previous year. Ten men were invalided (5 for amœbic dysentery, 5 for bacillary dysentery) as opposed to 8 in 1933, but there were no deaths (one in 1933).

In practically every other disease except dysentery, the general improvement in the hygienic environment of the soldier has led to a decrease in incidence. In dysentery the general trend is in an upward direction in spite of all the measures that have been taken to control it. The widespread distribution of the disease in the civil population and the primitive system of disposal of excreta which exists in most stations, combined with the presence of flies, create a problem which has so far defied solution.

The general lines of treatment remain the same, and are, on the whole, satisfactory. The great majority of cases were of a mild nature.

The incidence of dysentery in Quetta remained at a high level during the first eight months of 1934. Thereafter the figures were below those of 1933, and it seemed possible that the outbreak was abating. Subsequent figures support the view.

The scheme of classification of dysentery bacilli which was introduced three years ago continues to give satisfactory results, and it is possible to recognize immediately all but a small proportion of the dysentery bacilli which are isolated.

Investigations of the mannite-fermenting organisms which are still unclassified continue. One other type which was identified during the original investigation, but which was at that time very rare, has since been found to occur not uncommonly in other parts of India. Its antibody has therefore been included in one of the

diagnostic polyvalent sera which are issued. Accumulating evidence, which it is hoped to publish in the near future, seems to confirm that all these new types are actual causes of dysentery.

Malaria.—The 1934 figure is better than the previous best by no less than 16.6 per 1,000.

These are remarkable figures, but it would be a big mistake to imagine that they are likely to be surpassed, or even maintained. The recent severe epidemic in south-west Ceylon, and the history of malaria in India itself, are a warning against premature optimism. Before exchanging caution for confidence, it is essential to consider, in a comparative way, all the important aetiological factors that may influence the incidence of this disease. It is thought that examination of the statistics, coupled with comparative study of the aetiological factors, will tend to the opinion that, of late, a real and permanent improvement has occurred in the malaria situation in the army in India.

Now and again disturbing influences may, and almost certainly will, arise to lower the present record incidence. For example, were financial stringency to become more intense, no doubt the anti-malaria grant would be still further reduced; were operations in the field to be undertaken during adverse weather conditions, the unpleasant experiences of 1933 would inevitably be repeated; or if for some reason such as war, the supply of plasmoquine were interfered with or stopped, then the proportion and severity of the relapses would revert to the standards which existed before 1932. Such checks to progress are beyond medical control.

It is now proposed to set forth the grounds on which is based the belief that a real and permanent improvement has occurred; and for this purpose the past three years, 1932 to 1934, will be compared.

The periodicity of epidemic malaria is an important factor. In one of these years—1933—this factor was encountered in a severe form in the north-western sector of the country, where so many of the troops are stationed. There, a number of the garrisons suffered heavily, and yet the admission ratio per 1,000 was only 103.3, at that time, the third in order of merit since 1921. Apart from periodicity, meteorological conditions are those which exercise the dominant influence in the incidence of this disease in India.

In 1934, and speaking generally, meteorological conditions were adverse. They presaged a comparatively heavy malaria toll.

To summarize:—The active period (June to September) of the monsoon of 1934, over the whole of India, yielded a rainfall which varied from normal to excess. In some areas the excess was great, and affected a number of important military localities. In the transition period (October) rainfall was more or less in defect. Over some areas, including those in which the bulk of the troops are stationed, the defect was marked. The meteorological review leads to the opinion that in 1934 weather conditions were against a good malaria year.

In comparing annual incidences of malaria with annual meteorological conditions, there are, of course, a number of concomitant factors, the presence or absence of which must be taken into account. The periodicity of epidemic malaria has already been mentioned. Also, it must never be forgotten that, whereas in a particular year general meteorological conditions may be adverse, locally they may be quite favourable; extensive areas may be heavily rained upon and flooded, while cantonments in the same district may have the luck to escape. Then there is the factor of 'carry-over' of cases. Unfortunately, the statistical year does not coincide with the true malaria year. Any statistical year under review may have been preceded by a good or a bad malaria year and its figures will be favourably or adversely affected accordingly. Finally, there must be taken into account the fortuitous factor, field service; and also its allied condition, civil disturbance. The circumstances of war

and of active internal policing are, by their nature, powerfully antagonistic to malaria prophylaxis.

In 1934 epidemic malaria did not occur. Local meteorological conditions were generally adverse, and often markedly so. The 'carry-over' from 1933 was fairly heavy. The position was not handicapped by war or by civil disturbance.

Details regarding the corresponding factors in 1933 and 1932 may be studied in the reports on the health of the Army (India section) for the appropriate years. They are shown below in tabular form. A plus sign indicates that the factor was favourable to a good malaria year; a minus sign indicates that the factor was adverse.

	Epidemic malaria	Weather conditions	'Carry-over'	War and civil disturbance
1932 ..	+	—	—	—
1933 ..	—	— — —	+	—
1934 ..	+	— —	—	+

In itself, this rough picture is of no value; but if its constituents are examined separately and compared, it will be seen, firstly, that expectation would have made 1933 a worse year than it actually turned out to be; and secondly, that expectation would not have made 1934 as good as it turned out to be. There were grounds for forecasting that 1934 would be an improvement on 1933; but, on the above factors alone, there were no reasons for supposing that the 1934 figures would surpass those of 1932.

In the interests of prophylaxis, it is necessary to formulate an opinion as to why the 1934 statistics are so eminently satisfactory. The term 'eminently satisfactory' is used purposely instead of 'surprisingly satisfactory', because it is believed that certain comments and prognostications made in these reports during the past three years have now been justified. These concern three additional factors, *viz*, the effect of the new synthetic drugs, plasmoquine and ateb'in; the improved standard of anti-malaria field work resulting from the training at Karnal; the re-awakening of interest, and the application of more scientific methods, among the clinicians.

As these matters have already been dealt with in recent reports, it is only necessary to revert to them briefly now. It is beyond doubt that quinine-plasmoquine, as used in military medical practice in India, results in a more radical and more rapid cure of malaria than does the administration of quinine alone. It is also beyond question that ateb'in-plasmoquine effects a quicker cure than does quinine alone.

In certain cases quinine will continue to be more or less commonly employed; it has its advantages. In others ateb'in and/or plasmoquine are the drugs of choice—though it is not contended that these drugs, used singly or in combination, are complete and perfect remedies. They merely signalize a great step forward in malaria therapeutics. How great that step is may be measured with a fair degree of accuracy by comparing the total admission rates, on an all-India basis, from year to year; by studying the ratios of relapse to fresh cases; and by noting the varied lengths of time considered necessary to rid a patient's system of parasites, in accordance with the particular form of treatment prescribed.

Mention has already been made of the remarkable fall in the all-India admission ratio; and it has been pointed out that this decline is not confined to the year under review. Even in a very bad year (1933) the ratio was much below expectation.

As regards the relapse rate, the following is an extract from remarks in an annual report for 1934, made by a competent and reliable observer:—

'It seems clear that fresh cases of malaria are very rarely, if ever, contracted in the military cantonments of the Madras district. *A. subpictus* and *A. fuliginosus* have been identified in Madras and Bangalore, but none of the anophelines usually recognized as carriers.

Analysis of all the cases in the Q. V. O. Madras Sappers and Miners, Bangalore, the largest source of our malaria figures, shows that every case except one was admitted to hospital within a week of returning to Bangalore either from leave to his home, camp duty, or duty in frontier stations.

The treatment of these cases by plasmoquine and quinine or plasmoquine and atabrin, as per D. M. S. Circulars, has been so successful that *there has been no relapse for two years in a total of 112 cases*. The absence of any possibility of local re-infection makes Bangalore very suitable for judging the results of treatment'.

If we pass from this to an area where re-infection within cantonment limits is an everyday occurrence, we find the Assistant Director of Hygiene and Pathology, Northern Command, remarking thus:—

'The command relapse rate has fallen to 36.7. Many of the relapse cases were, however, the result of fresh infections contracted in 1933, during the Mohmand-Bajaur Operations'.

This is very different from the state of affairs which prevailed before the advent of the new drugs, when the relapse rate was customarily round about 90.

In the report for 1933, it was shown that relapse rates vary according to therapeutic and nursing conditions; and that these conditions were classified under 'specialized', 'selected' and 'general practice'. Other things being equal, it may now be said, with confidence, that the following are conservative estimates of the relapse rates in these three classes:—

Specialized ..	.. 8 per cent or under.
Selected ..	.. Average, 12 per cent.
General practice ..	.. Maximum, 30 per cent.

If these figures are exceeded, there is something amiss with the treatment of the patients; an extraneous factor is at work, such as war, or the effects of war, or re-infection is taking place. In making a differential diagnosis, fresh or relapse, this question of re-infection is an extremely difficult one to settle; and especially so in that area—the Punjab and the frontier—from which so much of the Army malaria comes. (The conditions in Bangalore are very exceptional). However, it is not for this reason that the table showing fresh and relapse cases, by commands, has been omitted from this year's report; the omission is due to the following circumstances:—

In order to make the cases against the new synthetic drugs as black as possible—in order to eliminate personal prejudice in their favour—it was decided that *all* admissions subsequent to a primary admission should be regarded as relapses; that the question of re-infection should not be considered at all.

The results were disappointing. Quite early in the malaria season it became plain that many cases labelled relapses were, in fact, re-infections.

The issue was further complicated by the fact that, in the Waziristan district, and throughout the Southern Command, an experiment on a big scale was in progress with the object of shortening the quinine-plasmoquine course of treatment. In the above areas, this course was cut down from the routine period of 21 days to 14 days. This must have resulted in the inclusion of a still bigger percentage of re-infections under the heading of relapse—particularly in the case of Waziristan where (as in the rest of the Northern Command) the risk of re-infection during the malaria season is abnormally high; very much higher than in the Southern Command.

Despite the unfair weightage above described, the relapse (so-called) percentages were well below

expectation, and much below those met with in the days before the new drugs were brought into use. In the Southern Command the percentage was 25; in the Waziristan district, 40; and over all India, 36.

In the forthcoming malaria year, it is not proposed to continue the short 14-day course of quinine-plasmoquine in the Waziristan district and the Southern Command; and it is not intended to fetter the diagnostic discretion of medical officers in the matter of relapse *versus* re-infection. It is confidently anticipated that these changes will result in a marked improvement in the fallacious relapse percentages of the year under review.

Improvement in the standard of field work continues, as more and more Karnal-trained officers become available. Nevertheless, supply does not equal demand, for qualified officers of the Royal Army Medical Corps return to England from time to time, tour-expired; and those of the Indian Medical Service are not infrequently transferred to the civil side, their services thereby being lost to the Army. It would be of great benefit to the Army if more military medical officers could be trained annually at the Ross Field Experimental Station for Malaria, Karnal.

Finally, mention must be made of the clinicians to whom too little credit for the improved malaria statistics has been awarded in recent years. The medical specialists in particular have devoted much time and attention to the therapeutics of the disease; and their investigations and reports thereon indicate a big advance in scientific outlook and practice.

Of other aspects of the anti-malaria problem there is little fresh to be said. As mentioned in these reports for 1932 and 1933, finance was subject to a severe 'cut' in 1932. This 'cut' still remains in force. So, too, does the decision arrived at in September 1931, that: 'In view of the present financial stringency, no further new works in the direction of mosquito-proofing of buildings should be undertaken until the financial situation is more normal'.

In connection with mosquito-proofing a curious and instructive incident occurred at Allahabad. Owing to the fact that most of the malaria contracted in that station was traceable to garrison duty in the old fort, it was decided to proof the building. The work was completed in January 1930 at a cost of little over £1,350. The admission ratio per 1,000 for malaria at Allahabad, averaged over the years 1925 to 1931, was 109. In 1932 it was 49; and in 1933, 40. In May 1934 the whole fort was denuded of its mosquito-proofing. This measure was carried out at the instance of the local authorities, after sanction had been obtained from command headquarters. The reasons put forward in support of this retrograde step were, that the netting shut out light, interfered with ventilation and collected dust and debris to such an extent that cleaning became impossible. In 1934 the admission ratio rose to 120 per 1,000.

One of the most encouraging features of the year 1934 was the interest shown here and there by authorities other than military in the anti-malaria problem. With the exception of Quetta, this interest was neither intense nor financially adequate; but a beginning has been made, and it is hoped that, from this, the participation of civil and municipal authorities in the anti-malaria fight will develop.

Although malaria remains the scourge of the British Army in India, the portents—as measured by sustained, if gradual, progress—are encouraging.

Tuberculosis.—There were 56 admissions for pulmonary tuberculosis, with one death and 51 men were sent home as invalids. The ratios per 1,000 were: admissions 1.0, deaths 0.02 and invalids sent home 0.94. Tuberculosis of other organs caused 8 admissions, one death, and 10 men to be sent home as invalids.

Diseases of the respiratory system.—There were 1,185 admissions, giving a ratio of 21.8 per 1,000. In 1933 the ratio was 21.8.

Acute and chronic bronchitis and catarrhal pneumonia accounted for 81 admissions, with 3 deaths and

6 invalided home. There were 90 cases of pleurisy, and 46 of laryngitis. Lobar pneumonia caused 176 admissions (3.2 per 1,000) as compared with 142 (2.6 per 1,000) in 1933. There were 9 deaths and the case mortality was 5.1 per cent against 7.7 per cent in 1933 and 12.8 per cent in 1932.

ADMINISTRATION REPORT OF THE DIRECTOR OF MEDICAL AND SANITARY SERVICES FOR 1934. CEYLON GOVERNMENT

During the year 1934 Ceylon has been fortunate in respect of the major communicable diseases, as there were only 35 cases of plague and the average for the previous five years was 62. There was one case of cholera which is the first recorded on the island since 1931 when there were six cases. Smallpox also seems to have been brought under control because in 1933 there were 337 cases and in 1934 there were only 72. Of the total deaths registered in the whole island from dysentery the percentage among Indian immigrants fell progressively from 1929 to 1933 from 32.5 per cent to 17.5 per cent but increased again to 21.5 per cent in 1934. The incidence of this disease also showed an increase from the previous year for there were 5,804 hospital cases and 34,369 outpatients treated for this disease in 1934 against 5,299 hospital cases and 22,614 outpatients in 1933.

Leprosy.—During the year 1,242 cases with 100 deaths, as against 1,227 cases with 76 deaths in 1933, were treated at the Government hospitals including the two asylums which are maintained in the island for the segregation of lepers.

The two leprosy survey officers started, in August 1933, the survey of Colombo city and during the earlier part of 1934 the survey was completed. Then the areas for survey were extended from the municipal to the rural areas of the Colombo district and at the end of the year the survey of the Colombo district and a portion of the Kalutara district was completed. During the latter half of October 1934, the survey officers visited the Batticaloa district and reviewed the work in that area.

The area surveyed during the year was 1,100 square miles in extent, having a population of nearly 1,250,000 inhabitants.

During the year 3 treatment clinics were opened in addition to the already established Central Clinic in Colombo.

In the areas surveyed in 1934, the officers detected 504 cases, of which 19 were in the Eastern Province, 112 in the city of Colombo, and 373 in the Western Province.

Yaws.—The following table shows the number of cases and deaths in the past five years:—

	1930	1931	1932	1933	1934
Hospital cases.	1,640	1,200	1,352	1,043	795
Hospital deaths.	5	4	4	3	2
Number of cases treated at dispensaries.	23,684	24,708	23,208	18,368	10,366
Total number of deaths for the island.	10	4	9	5	8

The continued decrease in the number of cases coming for treatment testifies to the success of the work of the *parangi* campaign. The itinerant medical officers who numbered 13 in 1930 were further reduced

from four to two in 1933. The work of these two officers had to be suspended from November 1934, owing to the malaria epidemic.

Malaria.—Malaria, the most prevalent disease in the island, assumed epidemic proportions towards the end of the year. The hospital admissions for the disease were 41,551 cases, as against 23,101 in the previous year, and the cases treated at the dispensaries and outpatients' departments of hospitals were 2,293,224, as against 1,199,075 in 1933. The epidemic started about the middle of October in Alawwa, Polgahawela, and surrounding villages and rapidly spread to other areas. It was most severe in the valleys of the three rivers—the Mahaoya, Deduru-oya, Kelani-ganga, and their tributaries—the provinces involved being the North-Western, Central, Sabaragamuwa, and Western. There were 988 deaths in hospitals from malaria in 1934, giving a death rate of 2.4 per cent as contrasted with 484 deaths with a rate of 2.1 per cent in the previous year. During the epidemic the proportion of cases of the malignant type of the disease was greater than normal and many deaths were due to cerebral malaria and to convulsions among children.

Ankylostomiasis campaign.—Marked progress in the campaign against ankylostomiasis was made in the year 1934, the number of treatments given during the year being the highest since the commencement of the campaign in 1916. That this result should have been achieved in spite of the almost complete suspension of activities during December on account of the widespread epidemic of malaria is extremely satisfactory. The benefit resulting from the campaign is well shown by the following quotation from the Registrar-General's report for 1933:—'The vigorous campaign conducted against the disease by the medical department has reduced the number of deaths and the death rate considerably in recent years, and the number of deaths fell from 1,955 in 1932 to 1,877, while the death rate which stood at 443 per million in 1930 and 363 in 1932 fell to 347 in the year under review, a rapid and striking decrease considering the small period in which it was effected'.

The average egg-count for the island which was 1,600 in 1933 was found to be 2,000 in 1934, and the percentage infected 81.2, as against 74.1 in 1933. A 50 per cent reduction in egg-count was effected as a result of treatment.

Poisoning after hookworm treatment.—Eleven cases of patients showing symptoms of poisoning after treatment were reported during the year, with nine deaths, giving the very low incident rate of less than 6 per million treatments.

A special conference was held to consider the question of poisoning. Dr. P. A. Maplestone of the Calcutta School of Tropical Medicine and Dr. W. P. Jacocks of the Rockefeller Foundation were also present.

(1) It was considered that the increase in the cases of poisoning was probably only apparent, as reports of deaths after treatment were being more frequently received since the issue of a circular by the Director of Medical and Sanitary Services at the end of the previous year requesting that all deaths should be immediately reported by telegram.

(2) At the time of the conference eight deaths had resulted out of about one and a half million persons given treatment, i.e., about one death per 150,000 treated.

(3) It was decided that, (a) the bulk of the deaths occur after combined treatment, but the symptoms incriminate oleum chenopodii; (b) the dosage of oleum chenopodii given allows a large margin of safety for a healthy person and variation in ascaridol content is of minor importance; (c) there was no need to change the dosage.

(4) Although there is no evidence to show that a condition of fasting has any direct bearing on deaths, it was felt that a light morning meal is desirable.

(5) In all the cases reviewed, it was found that the person treated was an unhealthy subject, but there was no one condition common to all the cases.

(6) It was felt that medical officers and apothecaries should pay special attention to the general condition of the patient and whenever necessary should improve the general condition before giving treatment.

(7) It was noted that no cases of poisoning in the series occurred in mass treatment administered by dispensers.

Action taken.—It was decided that, in the case of patients seeking outdoor treatment, a light morning meal is desirable about 2 hours before hookworm treatment. It was considered that special attention should be paid to the general condition of the patient, which should be improved whenever necessary before treatment.

The anthelmintics used during the year were oil of chenopodium, carbon tetrachloride, and tetrachlorethylene. When the present stocks of carbon tetrachloride are exhausted tetrachlorethylene will be used instead.

The good effect of the campaign is shown by an improvement in the general health of the people. That the people themselves realize this is evidenced by the fact that they now readily take the treatment, and sometimes even demand it.

[The above abstracts only touch on the principal diseases prevalent in the island, but the report contains many other sections indicating that all aspects of public health such as maternity and child welfare, better housing and feeding of the people, etc., are all receiving close attention and are being dealt with as energetically as funds will allow.]

THE ROCKEFELLER FOUNDATION. ANNUAL REPORT, 1934

PROGRESS IN YELLOW FEVER CONTROL

IN the fight against yellow fever it seems likely that a stage has now been reached where the old-time devastating epidemics are a thing of the past whose recurrence can be controlled. Long ago the predilection of recognized yellow fever for dogging the pathways of commerce was clearly recognized. The chief centres of havoc were the tropical seaports and river ports. In temperate zones yellow fever appeared as a warm weather epidemic in cities visited by infected ships. The outstanding epidemics of the past occurred when wooden sailing ships carried crews part of whom were suffering from yellow fever and at the same time not only transported the yellow fever mosquito but also gave it a chance to breed in the ships' water casks.

The entire campaign against yellow fever in the early days centred on an attack against the stegomyia mosquito (*Aedes aegypti*), recognized as the carrier of that disease.

The Rockefeller Foundation, from July 1925 to April 1934, maintained a field laboratory for yellow fever at Lagos, Nigeria. As a result of work originating in this laboratory it was confirmed that the black races of Africa had a type of yellow fever in which only a very small proportion of the infected persons suffered severe, clinically recognizable attacks. It was recognized that the widespread immunity of natives was probably due to the presence of yellow fever in a mild form. These milder cases could not be recognized until suitable diagnostic laboratory tests had been elaborated. It has now become clear that the great majority of cases, among both black and white races, may be quite mild, but they nevertheless give immunity to the person attacked. Moreover, these mild cases are capable of infecting the mosquito, and the mosquito in turn can infect additional persons.

Formerly it was not a simple matter to diagnose correctly mild cases of yellow fever, and it is still difficult to do so during the illness. The availability of the mouse for use in tests for acquired immunity has now made it a comparatively simple matter to ascertain whether a person has had yellow fever or not.

This so-called protection test has been applied not only to retrospective diagnosis, but also to the larger task of discovering areas in which yellow fever has occurred or is likely to occur. By limiting the test to young people and children, some notion can be gained as to how long ago yellow fever was present.

As a general result of these technical methods, which we owe to the laboratory, it has now become evident that there are two great endemic areas of yellow fever in the world. The boundaries of these areas have been approximately established. One of them occurs in Africa and extends from Senegal in West Africa to the upper reaches of the Nile. The other occurs in South America and occupies practically the whole of the Amazon Valley, reaching for short distances into other watersheds. Thus for the first time in history we can envisage with a certain degree of exactness just how large these regions are and exactly where they are located. It is something to know where we must look for the enemy.

Jungle yellow fever.—It has come to be recognized that yellow fever may exist, not only in a mild and almost unrecognizable form, but also in forms not associated with its recognized carrier, the stegomyia mosquito. The disease is transmitted and perpetuated in certain endemic areas by vectors different from the single one (stegomyia mosquito) encountered in Habana, Panama, and epidemic cities in general. Within these endemic areas, large parts of which are covered by jungle, there occurs yellow fever not carried by that mosquito and therefore offering to the scientific investigator new and as yet unsolved problems.

Since the strict correlation between the yellow fever mosquito—*Aedes aegypti*, or stegomyia—and yellow fever can no longer be maintained, we now have some inkling of the reason why complete elimination of yellow fever from the large cities through destruction of mosquitoes was not necessarily followed by the disappearance of the disease from tributary rural areas.

The factors responsible for the persistent endemicity of jungle yellow fever are as yet unknown.

Keeping yellow fever down.—By means of precautionary measures and intensive anti-mosquito work and through governmental quarantine restrictions, yellow fever has been kept successfully away from most of its old haunts in the Americas, despite the fact that the danger of bringing the disease from an endemic area into one not infected has recently been increased by the greater speed of travel. This new danger has been counteracted by rigid mosquito control work in some of the tropical cities visited by airplanes and ships, and by the International Sanitary Convention for Aerial Navigation of the Office International d'Hygiene Publique which ten nations have already ratified.

Another branch of the control service concerns the collection of liver specimens from fatal cases of brief febrile disease. This service has been greatly aided by the invention and general adoption of an instrument known as the viscerotome, which facilitates the collection of liver specimens.

Although an outstanding recent development has been the discovery that yellow fever may be benign in character, it should not be concluded from this that all the strains of yellow fever virus are benign, or that the disease is slowly dying out by becoming attenuated. This is contradicted by the simple fact that occasional fatal cases appear in regions where the protection tests indicate the presence of yellow fever. These fatal cases might never be discovered except for the viscerotome procedure of routine collection of liver specimens from all persons who die suddenly from febrile diseases. Moreover, the light cases spread yellow fever and keep it alive in areas from which it may be thought to have been eradicated by means of control measures.

Before the partial perfection of a vaccination method, first applied to human beings on 13th May, 1931, one of the tragedies of yellow fever work was the comparatively great danger to laboratory workers and men engaged directly in the fight against yellow

fever. Fortunately this danger seems to have been ended by the timely application of a method of vaccination which consists in administering modified virus accompanied by immune serum.

Intensive laboratory activity is now in progress in an effort to improve the present method of vaccination so that it can be applied to larger populations. In the laboratory of the Rockefeller Foundation no vaccination has been done without the use of human immune serum. Up to the present, although limited in application, this is still considered to be the only entirely safe method of vaccination.

Vaccination, even if extended, will in all likelihood continue to be only one line of defence. Of equal importance is the warfare directed at the eradication of the yellow fever mosquito. Above all there must continue the ceaseless efforts to penetrate farther into the mysteries of yellow fever, especially when, in its ultimate fastnesses, we are confronted with the disease in the absence of *stegomyia* mosquitoes.

MALARIA WORK

The Rockefeller Foundation engaged in anti-malaria activities in order to meet a problem which, next to that of hookworm disease, must be reckoned with in any programme aiming at a complete health service in tropical or temperate climates. Like hookworm disease, malaria is a debilitating disease. Under normal conditions, provided quinine is available, malaria incapacitates rather than kills. The use of quinine dates back several hundred years and has done yeoman service in preventing loss of lives. But it requires more than a drug to wipe out the source of malaria, which, when all is said and done, is the *Anopheles* mosquito.

The anti-malaria activities in which the Rockefeller Foundation has participated have therefore always taken the form of anti-mosquito work. These activities have in each case been based upon preliminary surveys of the area in which it was sought to control malaria. These surveys and the experiments based upon them have tended only to emphasize the variety of means which must be employed if malaria is to be successfully eliminated from any given area.

No attempts have been made in the activities of the Rockefeller Foundation to banish or eliminate malaria altogether from any country or state. Such a task involves united effort on the part of all communities, seconded by government regulation, so that the work of attacking the malaria mosquito, by whatever means or combination of means has proved to be most efficacious for the areas in question, can go on year after year until the mosquito index can be maintained indefinitely at zero.

Over and above the practical results obtained in malaria work in Italy there has been at least one major contribution in malaria research. The intensive study devoted to *Anopheles maculipennis* has led to the discovery that this species is composed of at least six varieties of mosquitoes, alike in form and shape but different in habits and environmental preferences. These varieties can be distinguished one from the other only by the circumstance that they lay different kinds of eggs. A minute study has been made of these mosquito eggs which are now used as the basis of the new classification. This biological difference in the varieties of *Anopheles maculipennis*, the malaria mosquito of Europe, has finally thrown light on the erratic distribution of malaria in Europe which heretofore had been a puzzle to malariologists. Certain varieties of *Anopheles maculipennis* prefer to feed on animals, and as agriculture has advanced they have become entirely zoophilic. Thus, although the malaria mosquito is widespread in Europe, its presence does not necessarily mean the presence of malaria. Anti-larval work enters a new phase by this discovery, which enables malariologists to give increased and more intelligent attention to the different varieties of *Anopheles maculipennis*. It is necessary to pay attention not only to the different species of *Anopheles*,

several dozens of which may transmit malaria, but in one case at least that of the *Anopheles maculipennis* of Europe, to six separate non-interbreeding varieties, each presenting problems of its own.

HOOKEWORM DISEASE AND OTHER DISEASES

The publicity centering around early hookworm campaigns had made many communities public health conscious. It put them into the correct frame of mind for doing something also against malaria and other widespread diseases. It served as an impulse to many types of health welfare work. Above all it stimulated the growing demand for better rural health departments.

Two illustrations of how hookworm work has successfully broadened out into more general public health work are afforded by Columbia, South America, and Ceylon.

In Ceylon, judged on its own merits and without reference to its general influence, the hookworm campaign might be considered disappointing in that the disease still remains one of the important causes of death. However, hookworm control work in Ceylon has had a powerful effect in Eastern countries in demonstrating in clear-cut fashion that it is possible to do successful health work of a modern type throughout the Orient. The disease itself has not yet been completely controlled, but in its connection with other diseases many human lives have been saved because of the new health habits and procedures such as health surveys initiated in the hookworm work. Throughout Ceylon the health units, which were an outgrowth of the hookworm campaigns, are making steady progress and exerting their influence not only in this island but in sections of the mainland of India and in other countries of Asia. The health units of Ceylon have become visiting centres much studied by health officials whose work lies in these areas and who obtain inspiration from the cumulative and steady progress of the Ceylonese public health work developed from the early hookworm activities.

In most countries where hookworm campaigns have at one time or another been carried on, this work has become merged with the general public health programme. Hookworm activities constitute one unit in the broader type of effort that to-day characterizes government health services. In a sense, therefore, the support which the Rockefeller Foundation now gives to local health demonstrations may be considered an extension of the former hookworm disease work.

Other diseases in which the Foundation has supported studies during 1934 are yaws, tuberculosis, diphtheria, smallpox, and undulant fever. The work in yaws centres chiefly in Jamaica, where investigations dealing with control measures and epidemiology are going forward. Definite plans of control for use in endemic areas have been formulated and are in operation. Special studies have been published dealing with a possible insect vector of yaws, a small fly, *Hippelates pallipes*.

Laboratory headquarters for tuberculosis work receiving Foundation support are situated in Cornell University Medical College. Studies in two rural areas in the United States have been made, and localized campaigns are under way in Jamaica and Austria. Chief operations centre in Jamaica where the government has been active in promoting tuberculosis work. The Foundation has been of aid in supplying an x-ray laboratory and in supporting field studies, with the object of learning more of the prevalence and epidemiology of tuberculosis in Jamaica. Throughout the tuberculosis work the emphasis has been on epidemiology.

An important study in diphtheria immunization was aided in the district of Eisenstadt, Austria. Studies on undulant fever which have for a number of years been conducted with Foundation aid in France are now drawing to a close. Additional miscellaneous studies

were published during 1934 in connection with milk sickness and intestinal amœbiasis.

[This abstract only covers about one-fifth of this extremely interesting report and although the other sections especially that of 'Medical Sciences' are of interest, we regret we have not space to spare for their abstraction.]

ANNUAL REPORT OF THE MEDICAL OFFICER IN CHARGE, HEALTH UNIT, PARTABGARH, FOR THE YEAR 1935

Introduction.—The health unit, Partabgarh, was started on 18th July, 1932, by the Department of Public Health, United Provinces, with the assistance of the Rockefeller Foundation (U. S. A.) and the Indian Red Cross Society (Provincial Branch). It covers an area 40 square miles in extent and contains a municipality, two town areas and 53 villages. The population, according to a survey made in 1933, is 36,530 (7,497 urban and 29,033 rural). The area is well supplied with roads. The soil is clayey and subsoil water level is low, being from 30 to 60 feet below the surface of the ground. Agriculture is the chief occupation of the villagers who are mostly illiterate and whose standard of living is poor.

Reporting births and deaths.—In addition to the usual reporting agencies (the public and the sweepers in towns and the choudkars in villages) the members of the staff (the sanitary inspectors, health visitors and the midwives) who collected the figures independently also submitted their reports to this office. It was found that while in Partabgarh town there occurred 179 births the 'Bakhshi' recorded 174. Similarly in Katra town the 'Bakhshi' recorded 95 deaths although the actual figure was 100. In case of Bela the reporting by the public was much less satisfactory, only 298 births being reported to the registration clerk out of a total of 445. In case of villages the reporting was even worse, only 647 births being registered in the police returns in place of 1,182, the correct figure. The percentage of births actually reported was thus 66.96 in case of Bela municipality and 54.74 in case of the villages. The percentage of omissions in the health unit as a whole was 36.31 in case of births and 42.99 in case of deaths.

Cholera.—On 25th July, a case of cholera was reported from village Pura Mohan. The source of infection could not be definitely traced. The anti-cholera measures taken consisted of isolation of patients in their homes, permanation of wells, administration of essential oils' cholera mixture, a vigorous campaign of inoculation, disinfection of floors with lime, burial of excreta underground, advice to the people about prophylactic measures and disinfection of infected material.

The epidemic was of a rather virulent type and, before it could be effectively controlled, two more villages were infected. The total number of seizures was 49 and of deaths 10. Four hundred and ninety-two anti-cholera inoculations were performed.

Plague.—No cases of deaths from plague were reported during the year. The juniors helped in trapping and destroying 936 rats.

Smallpox.—Smallpox was prevalent during five months of the year. There were no cases during the months of January, June, August, September, October, November and December. The highest incidence, 4 seizures, was recorded in March. The total number of seizures was 12 and of deaths 1. Special attention was paid to vaccination and re-vaccination of school children. The sanitary inspectors also did vaccination work. A detailed report will follow in due course.

Malaria.—The five anti-malaria centres were maintained as before. The amount of cinchona used during the year was 301 lb. 8 oz. and of plasmoquine 1,760 tablets.

General.—As a prophylactic measure against rabies 1,079 stray dogs were poisoned with strychnine.

HEALTH EDUCATION

Talks, lectures and demonstrations with the help of cinema, magic lanterns and posters were given during the year in clinics, schools, market places, fairs, meetings of co-operative societies, adult schools and other gatherings. Gramophone records on health topics were also utilized in connection with hygiene publicity work.

CONCLUSIONS AND GENERAL REMARKS

An appraisal of the Partabgarh health unit, which completed its first three years in July 1935.

(a) Maternity and child-welfare work

Work amidst the rural population was by no means easy. There was definite opposition on the part of the indigenous *dais* (midwives) who thought that their livelihood was going to be lost. The conservative women folk were none too keen to avail themselves of the services of the qualified staff during normal labours. In the early days, no information about labours was given by the people to the midwives. In some cases, the midwives, most of whom were Christians, were not permitted entry into the village homes. There were instances in which pregnant women even left the health unit to escape being attended (during confinement) by the workers of the new organization which was closely associated with an American Foundation. The staff had to gradually work its way, fighting conservatism, prejudice, ignorance, suspicion and apathy. All the indigenous *dais*, 278 in number, have been trained in the elements of clean midwifery and some of them have been provided with outfits. To-day they are a valuable asset to the health unit. Their training constitutes one of the lasting achievements, the credit for which goes to the present Director of Public Health of the province, Rai Bahadur Dr. K. L. Chaudhri, under whose instructions the work of training was taken up. The health unit staff has won the confidence of the rural population and is quite popular. The midwives are now called in in over 65 per cent of the labour cases. The poorest mother in the farthest villages to-day is ensured the facilities which are usually available to women in large towns only and at considerable expense.

At the clinic centres facilities are provided for weighing of babies, treatment of minor ailments, vaccination against smallpox, examination of urine of ante-natals, training of 'little mothers' and indigenous *dais*, group instructions and demonstrations to expectant mothers in the hygiene of pregnancy, aseptic midwifery, infant care and mother craft. A highly qualified lady doctor is in attendance to examine, advise and prescribe.

(b) Prevention and control of communicable diseases

The percentage of population immunized against smallpox is far greater than that in any other similar area in the province.

For control of epidemics there is an efficient trained staff which can be mobilized at short notice.

(c) Hygiene publicity

Popular health education has been carried out by almost all the known methods and the message of health conveyed into individual homes. Through the large maternity staff it has been possible to reach the female section of the population and to tackle ignorance and prejudices at their very roots. Never before the inauguration of the health unit was such a large section of this important group reached by the health staff.

(d) Vital statistics registration

The recording of vital statistics in the health unit is far more satisfactory. The records of 1935 indicate that the village 'choudkars' did not report as much as 45.25 per cent of births in the villages.

(e) *Rural medical relief*

The 38 village medicine chests afford facilities for the treatment of common ailments of women, children, school population and the public generally throughout the area. Through the anti-malaria centres facilities for treatment of that common and debilitating disease have been extended to villages.

(f) *School hygiene*

Health activities on an intensive scale have been started in all the schools in each of which a Junior Red Cross Group exists and 'detailed' medical inspections are carried out.

[A large number of distinguished health authorities have visited this unit and their remarks quoted here and there throughout the report are highly commendatory. We have deleted these as not being strictly germane to the subject-matter of the report itself.]

TRIENNIAL REPORT ON THE WORKING OF THE CIVIL HOSPITALS AND DISPENSARIES IN THE MADRAS PRESIDENCY FOR THE YEARS 1932 TO 1934

Number of hospitals and dispensaries.—The total number of medical institutions of all classes working in the Presidency at the beginning of the triennium under report, viz, on 1st January, 1932, was 1,337 while at the close of the triennium, viz, at the end of 1934, it was 1,356. The total number of institutions of all classes opened during the year 1934 was 27 of which 11 were local and municipal, 1 was private non-aided and 15 were rural dispensaries. The number of institutions that were closed during the year 1934 was 6, of which 1 was State special, 1 local and municipal, 1 private non-aided and 3 rural dispensaries. The number of State-public institutions working at the beginning of the triennium was 192 while at the end of the year 1934 it was 191. The number of State-special institutions was 34 at the end of the previous triennium, while the number at the end of the present triennium was 28.

Rural medical relief—Opening of subsidized rural dispensaries.—As the scheme has not been extended, but on the other hand curtailed to a certain extent, the triennium under report does not show any improvement under the subsidized medical relief scheme in rural areas.

Leprosy.—The anti-leprosy activities increased greatly during the years 1932, 1933 and 1934 as the result of the working of the group leprosy scheme sanctioned by the Government. The campaign under the direction of the chief leprosy officer developed in various directions chiefly due to the willing co-operation of the medical officers, the public and the financing bodies.

Clinics.—Leprosy clinics have been opened in all the Government medical institutions. The local boards, appreciating the useful work done to lepers, sanctioned amounts for opening clinics in the medical institutions under their control. The number of clinics that worked in 1932 was 219, in 1933, 322 and in 1934, 408. The bi-weekly attendance was above 50 in 48 clinics and above 100 in 12 clinics.

Results of treatment.—Several of the patients who persevere in treatment for a sufficiently long time are considerably benefited by the treatment. The cutaneous cases with a high concentration of the acid-fast bacilli respond very well to the esters *cum* oil mixture treatment.

District leprosy relief councils.—A striking feature in the leprosy campaign is the formation of the district leprosy organizations in accordance with the resolutions of the Calcutta and Madras Leprosy Workers' Conference held in 1933 with a view to maintaining sustained anti-leprosy activities in each district. Sixteen leprosy councils have been formed in the districts. These councils maintain a fund consisting of

contributions from local boards, donations, subscriptions, leper day collections, proceeds from benefit performances, etc., for leprosy work in the district.

The success of the leprosy campaign in the Salem district is due to the activities of the bands of social workers organized by Mrs. Todd. The success in the district was so marked that it was considered whether the experience gathered therein could not be utilized in other districts as well. The Government on the recommendation of the Surgeon-General therefore sanctioned in July 1933 for a period of six months in the first instance a scheme of anti-leprosy campaign in the districts of Chingleput and South Arcot where the incidence of leprosy is high. The campaign was organized and social work commenced by Mrs. Todd with the assistance of Mr. Curtis, assistant director of survey, as her secretary. Leprosy work needs persistent supervision and sustained zeal for development and continuance. As a result of the campaign conducted by the social workers 27 clinics were opened in South Arcot district. A leprosy day was held on 27th September, 1933, and a sum of Rs. 11,536-13-5 was collected. The results produced by Mrs. Todd and her secretary Mr. Curtis in the South Arcot district were very creditable and highly encouraging and indicative of hard work and able organization. As similar results were expected in Chingleput district the continuance of the scheme by the social workers was extended up to 31st March, 1934. The expectation has been justified.

As a result of the campaign in Chingleput district, local committees were formed in about ten places and the existing local committees were reorganized and revived. The duties of these committees are propaganda, visiting leprosy clinics and patients and helping the local clinics by collection of funds. Many members of the local committees made their clinics in the district ideal ones. This is largely due to the influence of the social workers. There has also been an increase of 30 per cent in the number of clinics as well as in the number of patients treated. The popularity and efficiency of the clinics has gradually increased. In view of the wide prevalence of leprosy in the Presidency and the need for isolating and providing proper treatment for those early infectious cases which demand hospital care, it was considered essential to increase the inpatient hospital accommodation. The admission of 100 more children into the Lady Willingdon Leprosy Settlement, Chingleput, was therefore approved.

The continuance of the scheme of social workers was further extended up to 1st April, 1935, the work being confined to the Salem district, as it was decided that the work already done in that district should be consolidated before the scheme in Chingleput district and South Arcot district could be dealt with similarly or extended to other districts.

As a part of the scheme of the district leprosy relief work in Salem district, the council has resolved to establish a home for untainted children in the district. Such a home should go a great way towards safeguarding the children of poor leprous parents from infection. The British Empire Leprosy Relief Association, Indian Council, New Delhi, on the recommendation of the Madras Provincial Committee for leprosy relief have resolved that the grant of Rs. 1,000 provided to the district leprosy relief council, Salem, for 1934 be paid to that council and that in addition a further grant of Rs. 2,000 per year for three years be made for expenditure on the proposed children's home in Salem district. The work of the district leprosy council, Salem, shows that great pains have been taken by the social workers in stimulating public interest in the campaign to eradicate leprosy.

Mrs. H. C. Buck in Saidapet has also been doing very useful work in completing a survey of the whole of Saidapet at which place 456 cases were detected in a population of 33,000. Mrs. A. Kuriyan also took a keen interest in the leprosy work in Madras City.

She obtained funds by holding a leper day and was instrumental in opening two private clinics.

Some clinics have social committees for attending to the needs of the clinics. In some clinics the medical officers have been very enthusiastic in affording relief to the lepers and have induced the public to arrange for the construction of clinic sheds and for the feeding of the indigent lepers on treatment days.

Tuberculosis.—The total number of patients suffering from tuberculosis of the lung as well as from other tuberculous diseases treated during the year 1934 was 66,478 with 1,048 deaths as compared to 59,899 with 1,008 deaths in 1933 and 59,106 with 917 deaths in 1932.

The total number of patients treated in the Government Tuberculosis Institute, Madras, during the year 1934 was 9,226 which exceeds the number of patients treated during the year 1933 by 835. The daily average attendance in 1934 was 158.02 which is 16.16 more than the daily average number in 1933. The total number of patients treated in the Government Tuberculosis Hospital, Madras, during the year 1934 was 704 with a daily average number of 80.32 as compared to 817 with a daily average number of 88.72 in 1933 and 826 with a daily average of 88.60 in 1932. The total number of deaths during the year 1934 was 13. The fall in the total number of patients treated in the Tuberculosis Hospital, Madras, during the year 1934 as compared to the previous years is partly due to the longer stay of the patients in the hospital. It is observed that the prevalence of tuberculosis is most between the ages of 15 to 24 years and 25 to 34 years, i.e., during the active period of life. Of the 704 cases treated in the Tuberculosis Hospital, Madras, 532 were cases of pulmonary tuberculosis while the remaining were either non-tuberculous affections of the respiratory tract or extrapulmonary tuberculosis cases.

The treatment of tuberculosis is still in its infancy in this Presidency as regards the provision of beds in special hospitals or sanatorium dispensaries and clinics. A sanatorium on the lines of that at Madanapalle is

needed in various groups of districts within easy distance of the largest towns; one is badly needed outside Madras. A sanatorium is proposed at Perundurai some 48 miles from Coimbatore and local efforts are well advanced in this direction.

Medical education.—Considerable improvement was effected in the matter of medical education in this Presidency during the triennium. The recommendation of the Medical Education Committee appointed by the Government that medical education should be centralized in Madras and Vizagapatam has been given effect to by closing the medical school at Tanjore from 1st May, 1933. Admissions to the medical school, Tanjore, were stopped in July 1932, the students from the school being transferred to the Stanley Medical School, Madras. The L.M.P. course has been extended to five years to enable the students to have sufficient scientific knowledge and clinical experience before they pass out of the schools, and to anticipate their hopes for inclusion in a common medical register. The curriculum of studies has also been revised. The percentage of pass marks for the five-year course students in all board examinations prior to the final qualifying examination has been revised in conformity with the standard of the General Medical Council of the United Kingdom. It is noteworthy that it has been possible to admit a class of students possessing better preliminary educational qualifications. With the introduction of the five-year course for the L.M.P., the school laboratories have been brought up to the requisite standard.

The year 1934 was marked by an epoch-making event in the history of Indian medical education. The primary fellowship examination of the Royal College of Surgeons of England was held at Madras in December 1934 for the first time in India. It is a matter of gratification that many of the Madras students came out successful in their first attempt. Out of 60 candidates appearing for the examination, 21 were successful—of whom 13 belong to Madras.

Correspondence

LATE REACTIONS AFTER ANTI-CHOLERA INOCULATION

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—During the last cholera epidemic in the Bassi district, Patiala State, mass anti-cholera prophylactic inoculation was done. There was a general and a local reaction which lasted for two or three days following the inoculations.

About 8 to 10 per cent of the persons inoculated got another general and local reaction on the 12th, 13th or 14th day of the inoculation, in the usual form of a pyrexia (varying from 100°F. to 102°F.) and local redness at the site of the injection along with pain and tenderness. But this secondary reaction, if I may so call it, was milder in type than the primary one. No other sign or symptoms were observed. This secondary reaction lasted for about 28 to 36 hours only. Many of the sturdy villagers did not care at all at its appearance and thus got no treatment for it, while others who came to us for advice were treated on general lines and symptomatically.

The only possible explanation that I could think of at that time was that it might be due to an abscess formation due to negligence on our part of not adopting sufficiently rigid aseptic technique. But, out of the four thousand inoculations done by me in that part of the district, only one of them developed into an abscess on the sixth day. We had taken every possible aseptic precaution throughout and the vaccine which was supplied by the Central Research Institute, Kasauli, was used within two or three days of its receipt.

I consulted my other colleagues who too were working in the other cholera-stricken areas of the State about it and all of them also observed the same phenomenon. A fruitless search of all the available literature on the subject was made to know the cause and significance of this secondary reaction after the prophylactic anti-cholera inoculations.

I would like to know if others have observed this secondary reaction in their practice, and if they can enlighten me as to its possible cause and significance.

Yours, etc.,

MADAN TEWARI, M.B., B.S.
Honorary Clinical Assistant.

RAJINDRA HOSPITAL,
PATIALA (STATE).
4th February, 1936.

TREATMENT OF CHRONIC DIARRHŒA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Though I myself doubt whether the following is worth publishing in a medical paper, while discussing treatment of chronic diarrhœa, my friends were greatly impressed with my experience and pressed me to report it in your valued journal.

Some five years back—I was then in Karachi—I suffered from sprue (?). I took parathyroid and calcium, emetine injections, Taka-diastase, fresh liver—by mouth, Anabin, etc., without any effect. This went on for six to seven months. I used to get six to seven large motions per day. Then in the hospital I found

a sample box of Ultracarbon (Merck). As per instructions I took two teaspoonfuls per day—one after each feed. From the first day, uneasiness and sinking feeling was much better. On this, I stopped every drug and persevered with Ultracarbon and milk diet for three to four months. By this time I was practically all right and gradually reverted to normal diet.

Yours, etc.,

K. J. MANDKANI, D.O., M.B., B.S.

SIR J. J. HOSPITAL,
BYCULLA, BOMBAY,
17th February, 1936.

INTESTINAL TUBERCULOSIS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I must compliment Dr. Shrikhande for his very comprehensive article on intestinal tuberculosis which appeared in the February issue of the *Gazette*. One thing is not clear to me. It appears that he is optimistic about our present-day means of diagnosing this condition early. But I must confess that, even after going through his article very carefully, my difficulties remain the same as before.

Regarding early symptoms he mentions nervousness, slight impairment of appetite and constipation as the most useful diagnostic triad. It is a matter of common knowledge that impairment of appetite and constipation are usual symptoms of pulmonary tuberculosis. Nervousness can hardly be considered as a dependable symptom. Persistent diarrhoea and tenderness over abdomen are of definite diagnostic value but unfortunately they appear rather late.

As regards laboratory methods the writer himself admits that the presence of tubercle germs in the stool by itself is of little significance. Perhaps it is not unreasonable to think that the presence of pus and blood in the stool is of little guidance in a tropical country where different kinds of colitis are so very common.

Radiological diagnosis appears to be the most dependable according to the writer, as well as other workers. Evidently it depends on the hyper-motility of intestines due to tuberculous ulcerations. Under the heading 'Symptoms', the writer mentions that ulcerations in the small intestines which occur early cause constipation. Perhaps it is reasonable to infer that a lesion which causes constipation is not likely to hurry over the barium meal indicating hyper-motility. If that be the case it is doubtful if x-rays be of any use to detect early lesions in intestines. Even when hyper-motility is shown by x-ray examination due to extension of ulcerations to caecum and colon, have we got means to ascertain radiologically whether such hyper-motility is due to tuberculous lesions or to other forms of colitis commonly found in tropical countries? A tuberculous patient is not immune from colitis due to other causes.

For these reasons I am at a loss to understand how we have materially advanced in the matter of diagnosing this condition early. However, I will feel obliged if Dr. Shrikhande kindly throws more light on the issues raised herein. As a general practitioner, like others, I face these difficulties every now and then.

Yours, etc.,

A. ROY CHOWDHURY, B.Sc., M.B.

2, LADY HARDINGE ROAD,
NEW DELHI,
29th February, 1936.

THE FEEDING OF INFANTS IN INDIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I would ask you to be good enough to correct an omission in my article on the feeding of children published in the January 1936 number of the *Indian*

Medical Gazette under the heading Cow and Gate, page 6.

I understand that to the export brand of Cow and Gate is now added a natural concentration of vitamin D in approved quantities, namely Vitex. Under the heading Cow and Gate therefore the Vitamin Content should read as 250/300 International units per pint and no other form of vitamin D need be added.

Yours, etc.,

E. H. VERE HODGE, M.D. (Cantab.),
LIEUTENANT-COLONEL, I.M.S.

MEDICAL COLLEGE,
CALCUTTA,
10th March, 1936.

Service Notes

APPOINTMENTS AND TRANSFERS

THE Viceroy and Governor-General has been pleased to make the following appointment on His Excellency's personal Staff:—

Colonel H. C. Buckley, to be Honorary Surgeon, *vice* Major-General E. W. C. Bradfield C.I.E., O.B.E., vacated. Dated 21st December, 1935.

Lieutenant-Colonel M. G. Bhandari, Superintendent, Yeravda Central Prison, is appointed to officiate as Inspector-General of Prisons, Bombay Presidency, *vice* Lieutenant-Colonel E. E. Doyle, proceeding on leave.

Lieutenant-Colonel R. V. Martin, on return from leave, is appointed to officiate as Inspector-General of Prisons, Bombay Presidency, *vice* Lieutenant-Colonel M. G. Bhandari, reverting.

Lieutenant-Colonel M. G. Bhandari, on relief, is appointed to be Superintendent, Yeravda Central Prison, *vice* Mr. D. N. Chiplunkar, reverting.

Lieutenant-Colonel R. Hay, an Agency Surgeon, is appointed as Civil Surgeon, Ajmer, and Chief Medical Officer in Rajputana, with effect from the afternoon of the 19th December, 1935.

Lieutenant-Colonel W. J. Webster, M.C., Officiating Assistant Director, Central Research Institute, Kasauli, is appointed to officiate as Director of that Institute, in addition to his own duties, *vice* Lieutenant-Colonel J. Taylor, granted leave.

The services of Lieutenant-Colonel C. de C. Martin are placed permanently at the disposal of the Government of Burma, with effect from the 20th June, 1932.

The services of Captain D. K. L. Lindsay are placed temporarily at the disposal of the Government of Burma, with effect from the 17th December, 1935.

The services of Captain C. K. Lakshmanan are placed temporarily at the disposal of the Government of Bengal, for appointment as Port Health Officer, Calcutta, with effect from the 10th February, 1936.

The services of Captain M. Jafar, an officer of the Medical Research Department, on foreign service under the Indian Research Fund Association, are placed temporarily at the disposal of the Government of Madras, for appointment as Officiating Assistant Director, King Institute of Preventive Medicine, Guindy, with effect from the date he assumes charge of his duties.

PROMOTIONS

Major to be Lieutenant-Colonel

J. E. Ainsley. Dated 29th December, 1935.

The provisional promotions to the rank of Major of the undermentioned officers are confirmed:—

A. Tait.
G. P. F. Bowers.
J. S. Riddle.
J. E. Gray.

S. Smyth.
M. H. Wace.
R. L. Frost.
J. C. Drummond.
D. M. Fraser.
J. F. Shepherd.
K. S. Fitch.
S. C. H. Worseldine.

Captain to be Major

G. J. Joyce. Dated 22nd December, 1935.

LEAVE

In supersession of previous notification, Lieutenant-Colonel E. E. Doyle, C.I.E., D.S.O., Inspector-General of Prisons, Bombay Presidency, is granted leave for 8 months, from the 22nd February, 1936, or any subsequent date of relief.

Major R. S. Aspinall, an Agency Surgeon, is granted leave on average pay for 3 months combined with leave on half-average pay for 4 months and study leave for 3 months, with effect from the afternoon of the 19th December, 1935.

RETIREMENT

The undermentioned officers retire:—

Colonel C. A. Gill. Dated 12th August, 1935.

Lieutenant-Colonel J. D. Sandes. Dated 22nd December, 1935.

Notes

BOMBAY OBSTETRIC AND GYNÆCOLOGICAL SOCIETY

At a clinical meeting of the Bombay Obstetric and Gynæcological Society held at the rooms of the Bombay Medical Union, Lieut.-Colonel Spackman said that the menopause marked the termination of the reproductive stage of a woman's life and cessation of menstruation was usually the most prominent and sometimes the only clinical manifestation.

Dealing with the treatment, he said that encouraging the patients to take interest in the household, social and other outdoor activities, which took their minds off their worries, had beneficial results. There were some cases which needed some form of active treatment. Pelvic diathermy, massage, visits to health resorts and spas were more useful for their unbalanced minds than for any real organic change. Among the drugs bromides and valerian well deserved their traditional reputation. The opium group should be avoided. Insomnia can be treated by sedatives of the barbiturate series like luminal. A definite course of these remedies was better than intermittent and irregular use. Organotherapy results were unsatisfactory because of the great variations of ovarian hormone in the individuals and at different times in the same individuals, uncertainty of the potency of various preparations in the tropics and variations of action of the different secretions of the digestive system on these preparations. The ovarian hormones could be stimulated by x-ray and diathermy directly on the ovaries or indirectly through activating the pituitary gland. Alternative to stimulation was substitution therapy by supplying the hormone orally or by injection. Ovarian grafts either autogenous or heterogeneous were also advocated and they with different degrees of success or failure. No method was yet devised by which these grafts were kept active for a long time. Only those hormone preparations, containing folliculin secretion, which were used by injections had given good results in his hands. Of these Progynon B Oleum was found to be most effective. Yet many cases

were unaffected by its use. Complications like pruritus vulvæ and senile vaginitis were treated by folliculin hormones.

EVIPAN SODIUM

In introducing an anæsthetic that can be given by intravenous injection with the least possible preliminaries and with the minimum of qualified assistance, it would almost seem that the chemists in Elberfeld were considering India's most pressing requirement.

This preparation has already acquired a past history in this country and it has been very extensively used, but, when once it has penetrated into every dispensary and small rural hospital in India, it is assured of a very great future.

The manufacturers have prepared a very useful booklet on the technique of Evipan Sodium which we recommend to all doctors who propose to take advantage of this useful advance in anæsthetics.

The book is well written and instructions are given explicitly. The whole subject is dealt with in a scientific and systematic manner. It is the type of book that, except for the fact that Evipan Sodium is a proprietary preparation, would have been priced at two rupees or so, and would have been assured of a wide circulation. As it is, the agents in India of the manufacturers are prepared to send a free copy to any doctor interested in the subject. Applications should be made to the Haverro Trading Company, Limited, Post Box 642, Bombay.

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Original Articles

IMMUNOLOGICAL METHODS IN THE DETERMINATION OF INFECTION IN A RANDOM SAMPLE OF HOSPITAL ADMISSIONS

(PART I)

(THE FREQUENCY AND CONCENTRATION OF 'H' AND 'O' AGGLUTININS FOR THE BACILLI OF THE TYPHOID-PARATYPHOID GROUP IN 280 INDIVIDUALS ADMITTED INTO THE CARMICHAEL HOSPITAL FOR TROPICAL DISEASES, CALCUTTA)

By C. L. PASRICHA, M.A., M.B., B.Chir., M.R.C.S., L.R.C.P.
CAPTAIN, I.M.S.

G. PANJA, M.B., D.B.

and

S. LAL, M.B., B.S.

(From the Department of Bacteriology, School of Tropical Medicine, Calcutta)

RECENT studies employing immunological methods in the diagnosis of infection have conclusively shown that the occurrence of agglutinins in the serum of apparently healthy individuals can be considered as evidence of exposure to the specific infectious agent either through artificial means such as vaccination or as a result of natural infection, clinical or sub-clinical. That the incidence of antibodies against a given organism is an index of the prevalence of infection by that organism in a particular region is stressed by Topley (1933) who, after reviewing the available evidence, concludes that 'whatever may be our views with regard to the mode of origin of the "normal" antibodies there is now no doubt that the different frequencies observed in different countries, age groups, social classes, occupational groups, etc., is highly correlated with the risk of infection to which these groups are exposed. We shall, for instance, certainly not err if we draw from the fact that group A shows a 10 per cent frequency of agglutinins to bacillus X and group B a 0.2 per cent frequency, the conclusion that infection with that organism is common among the population of which group A is a sample and rare among the population exemplified by group B. It should perhaps be emphasized that the difference is the most significant point. If we found, in a large number of samples of adults, drawn from many different countries and many different occupational groups, that the frequency of a particular antibody at a particular titre was always in the neighbourhood of say 5 per cent, we should, in the present state of our knowledge, be hard put to it to determine whether this indicated uniform frequency of the infection in question, or whether we were dealing with some non-specific effect. Surveys of this kind are becoming increasingly more common, and serve

a very useful purpose. It is often important to map out infected areas from the administrative point of view, and a knowledge of the infections prevalent in his district is of considerable help to the bacteriologist faced with the diagnosis of a clinically atypical fever—from this viewpoint this particular method of survey might be exploited far more widely than it is, especially in tropical countries'.

In a country such as India where 'fevers' of so many different types and of different aetiologies exist and where facilities for the determination of the exact nature of the different pyrexias are limited it is impossible to obtain any reliable records of the incidence of the different 'fevers'. The enteric group of fevers are much more prevalent than the records indicate as most cases are included among 'fevers'. Even the incidence of these fevers in a number of the larger towns, where facilities for exact diagnosis exist, is unlikely to be even approximately correct. We have not been able to obtain any reliable figures referable to the whole of India.

The deaths and death rates from enteric fevers for Bengal are extracted below from the Bengal Public Health Report for 1930:—

TABLE I
Deaths and death rates from enteric fever

Year	NUMBER OF DEATHS			
	Province	All towns	Calcutta	Rural area
1929 ..	10,487	1,288	765	9,199
1930 ..	11,144	1,222	729	9,922
<i>Death rates per mille</i>				
1929 ..	0.22	0.41	0.71	0.21
1930 ..	0.24	0.39	0.68	0.22

'Eighteen towns returned rates above the urban average for enteric fever (0.39), the highest being registered in Hooghly, Chinsurah. No death from enteric fever was returned from 63 towns. 1.6 per cent of fever deaths and 1.07 per cent of total provincial mortality were due to enteric fever against 1.5 and 0.9 per cent in the previous year'.

It can be confidently asserted that the apparently greater incidence of the disease in Calcutta, as judged by the mortality rates, does not represent greater degree of infection in that city but is the result of better laboratory facilities and more accurate diagnosis. The statement that no deaths from enteric fevers were returned from 63 towns can only be taken to represent that no death in these towns was diagnosed as due to enteric fevers.

The Army in India has maintained very careful records of the incidence and mortality rates of enteric fevers, and up-to-date serological methods have been introduced in the diagnosis of these fevers. The following table giving the incidence and deaths amongst protected and

unprotected classes in the Army is extracted from the Annual Report of the Public Health Commissioner with the Government of India (1934).

is exceedingly small. We badly need more detailed information about the frequency and concentration of 'H' and 'O' agglutinins for bacilli of the typhoid-paratyphoid group in the

TABLE II

Showing the incidence and deaths from enteric fevers among protected and unprotected classes in the Indian Army

Group	Strength	ACTUAL		RATIO PER 1,000		Case mortality per 100
		Cases	Deaths	Cases	Deaths	
1932 .. { Protected ..	54,554	172	13	3.15	0.24	7.55
	655	16	2	24.42	0.35	12.50
Average of 5 years. { Protected ..	53,885	179.4	13.2	2.33	0.24	7.36
	1,382.4	20.2	1.8	14.61	1.30	8.91

It will be seen that the incidence of enteric fevers is high in the unprotected group of individuals. We can take the incidence in the unprotected group of individuals in the Army as representing approximately the incidence of enteric fevers in the civil population.

Immunological methods, as far as we are aware, have not been employed for the determination of the degree of infection by the enteric group of organisms in this country. As serological methods are pre-eminently suitable for conditions prevailing in India it was resolved to estimate the 'H' and 'O' agglutinins for the enteric group of organisms in sera of certain individuals admitted into the Carmichael Hospital for Tropical Diseases. At the outset, we would state that no serological methods can give such definite or such convincing data as the actual isolation of the infecting organism. When, however, the difficulties inherent in cultural methods for the detection of typhoid carriers and the expense, the organization and management of an adequately controlled typhoid-carrier survey are realized, it will be apparent that the comparatively simple tests, such as the agglutination test when properly controlled, may be expected to yield more reliable results than haphazard stool examinations. Recent works in different parts of the world where the frequency of agglutinins in samples of a community has been estimated have shown that such surveys afford an indication of the frequency and distribution of a particular infection in that community. In table III are summarized some of the published results of the frequency of agglutinins for the three principal types of the enteric group of organisms.

There are many difficulties in the interpretation of observations such as those recorded in table III. When the published data are carefully studied it will be obvious that the sum total of the evidence that has been accumulated

serum of 'normal' persons. It is established that there can occur a fall in the frequency of agglutinins among the population as a whole as a result of the 'wearing-off' of the effect of the actual disease or inoculation. There are recovered cases of typhoid fever who, although they continue to pass the organism, do not show any agglutinins in the blood. Ledingham and Arkwright (1912) record 4 out of 9 carriers who showed no agglutinins and Havens (1935) cites 3 out of 6 carriers with no agglutinins either for a stock laboratory culture or for the carrier's own strain. On the other hand there is evidence to suggest that non-enteric febrile diseases following vaccination or a previous attack of typhoid can give rise to an anamnestic reaction which is a non-specific re-stimulation of the agglutinins. Felix (1928) has shown that this non-specific re-stimulation occurs only with the 'H' agglutinins and not in the 'O' agglutinins.

We do not propose to review the great mass of literature that has grown up on the subject of so-called 'normal agglutinins'. The published evidence, such as it is, shows that, in localities where there is a high endemic rate of enteric fevers, a large proportion of the population show agglutinins for these organisms, and conversely, in localities with low incidence of these fevers, only a small proportion of individuals have these agglutinins.

The present paper records the results of the examination of sera for the presence of agglutinins for the typhoid-paratyphoid group of organisms.

Sera were obtained from 280 non-enteric patients admitted into the Carmichael Hospital for Tropical Diseases during the year 1935. The patients were all Indians and the majority of them permanent residents of Calcutta or neighbouring districts. These sera were tested against eight different antigens of the typhoid-paratyphoid group, certain strains of the proteus X group, a series of authentic dysentery

TABLE III
Showing the percentage of sera obtained from individuals not suspected of enteric infection giving agglutination at the specified titre or higher

Author	Year	Country or district	Number of 'normal' persons examined	PERCENTAGE SHOWING AGGLUTININS AT SPECIFIED TITRES AND OVER											
				Typhosum						Paratyphosum A					
				'H'			'O'			'H'			'O'		
				25 and over	50 and over	100 and over	25 and over	50 and over	100 and over	25 and over	50 and over	100 and over	25 and over	50 and over	100 and over
(1) Rosher and Fielden.	1922	London	181	3.0	—	—	—	—	—	0.0	—	—	4.0	—	—
(2) Gardener.	1929	England	47	—	—	—	—	—	—	—	—	—	—	—	—
(3) Smith, Macvie and Newbold.	1930	England	154 males 146 females	23.3 4.7	21.6 2.7	17.2 0.7	49.0	2.1	—	11.6 0.0	9.0 0.0	6.4 0.0	9.7 2.0	9.1 1.3	5.2 0.0
(4) Havens and Mayfield.	1931	Alabama	1,136	23.0	9.0	3.0	—	—	—	—	—	—	—	—	—
(5) Duane y and others.	1932	Memphis	100	—	—	20.0	—	—	—	—	—	—	—	—	—
(6) Gardener and Stubington.	1932	England	50	—	—	—	38.0	6.0	2.0	—	—	—	—	12.0	2.0
(7) Horgan.	1932	Africa (Sudan).	70	—	—	—	7.1	—	—	—	—	—	—	—	—
(8) Giglioli.	..	British Guiana.	150	27.0	—	—	—	—	—	9.0	—	—	5.0	—	—
(9) Lewin.	1934	South Africa.	442	15.1	—	4.4	53.4	—	8.3	—	—	—	—	—	—
(10) R. Amzel.	1934	France (Etat).	346	6.9	—	4.3	—	—	—	1.2	29.4	0.4	5.0	—	—
(11) Bole.	1935	America (Ohio).	17	82.3	76.4	64.7	58.9	47.0	35.3	29.4	29.4	23.5	29.4	29.4	11.8
(12) Pasricha.	1933	Darjeeling	85	32.0	14.0	8.0	—	—	—	9.0	4.0	1.0	25.0	12.0	3.0
(13) Pasricha et al.	..	Calcutta	280	20.7	10.7	2.8	11.8	6.4	1.8	6.0	2.5	0.7	7.5	5.7	2.5

Note:—The titres recorded by some of the workers were different from those shown in the table, but for the sake of clarity these have been included in the nearest figures, for example if the titres recorded were 1 in 20, 1 in 40 and 1 in 80 these have been included in 1 in 25, 1 in 50 and 1 in 100. When the worker has not recorded the results with certain antigens or at certain dilutions this is shown as —.

At the bottom of this table is given the result of our own inquiry in Darjeeling and Calcutta.
Remarks:—(1) Uninoculated persons. (2) No history of previous inoculation or disease. (3) The higher percentages in the males are undoubtedly due to previous inoculation and the figures for the females represent what one may expect to find in uninoculated adults. (4) Of sixty individuals from whom accurate history was obtained, seven had been vaccinated and five had had typhoid fever. (5) Dilutions below 1 in 100 not used. Definite information as regards no previous attack in 62 out of the 100 individuals. (6) Unselected individuals not suffering from enteric fever. (7) Indigenous persons with no history of attack or inoculation. (8) Quoted by Topley (1933). (9) Accurate history could not be obtained from many of the individuals. (10) Normal individuals who had not been vaccinated and who had not had enteric fever. (11) Two of the 17 individuals were probably typhoid cases, and five had history of previous attack or were probably vaccinated. This explains the very high percentage showing agglutinins. The paucity of the numbers does not justify any conclusions to be drawn from these results. (12) Unpublished results of an investigation carried out amongst individuals of different occupational groups. (13) Unselected hospital cases suffering from non-enteric group of diseases and uninoculated.

organisms and certain selected groups of non-authentic dysentery organisms. In this present paper only the results obtained with the typhoid-paratyphoid group of organisms are recorded. To avoid unnecessary complication in the reading of results, reactions with other organisms have been omitted.

Technique.—Each serum was put up in five dilutions from 1 in 25 to 1 in 400 and was tested against the following eight suspensions of the typhoid-paratyphoid group of organisms:—

(1) Formolized broth suspensions of *Bact. typhosum*.

(2) Formolized broth suspensions of *Bact. paratyphosum A*.

(3) Formolized broth suspensions of *Bact. paratyphosum B*.

(4) Formolized broth suspensions of Hirschfeld's bacillus.

The above are 'H' suspensions containing about 500 million organisms per c.cm.

(5) Alcoholized agar-culture suspensions of *Bact. typhosum*.

(6) Alcoholized agar-culture suspensions of *Bact. paratyphosum A*.

(7) Alcoholized agar-culture suspensions of *Bact. paratyphosum B*.

(8) Alcoholized agar-culture suspensions of Hirschfeld's bacillus.

The last four are the 'O' suspensions. The test strains were examined periodically for agglutinability with standard sera and every

strain of Hirschfeld's bacillus that we employed was not sufficiently agglutinable, though it was well agglutinable by its homologous serum.

We did a comparative series of tests employing Felix's strains *Bact. typhosum* H901 and *Bact. typhosum* O901 obtained from the Lister Institute and 'H' and 'O' suspensions prepared with our standard laboratory typhosum strain. The results were parallel but the motile strain 901 was not as sensitive as the formolized suspension of our local strain. The results recorded are those obtained with our local *Bact. typhosum*. The same strains were used throughout the experiment.

The serum-suspension mixtures were incubated in a water bath at 52°C. The 'H' agglutination was read after two hours and the 'O' agglutination after about 18 hours. The readings were made with the aid of artificial light against a black background and the agglutination was read to the limit of visibility with a magnifying lens. Only clear-cut definite results were recorded. Adequate controls were maintained throughout.

When agglutination occurred in all serum dilutions, a second test was made, a greater range of dilutions of the serum being used. In all cases an end titre was determined.

Tables IV and V give a summary of the results of the examination of the 280 sera. We have grouped the patients into various age groups and sub-grouped them into two main

TABLE IV

Percentage of sera obtained from 280 individuals not suffering from enteric infection giving different type of agglutination at specified titres or higher

Organisms	SHOWING TOTAL AGGLUTININS			'H' AGGLUTININS			'O' AGGLUTININS		
	1 in 25 and over	1 in 50 and over	1 in 100 and over	1 in 25 and over	1 in 50 and over	1 in 100 and over	1 in 25 and over	1 in 50 and over	1 in 100 and over
<i>Bact. typhosum</i> ..	28.2	12.8	3.9	17.1	8.2	2.8	11.8	6.4	1.8
<i>Bact. paratyphosum A</i>	7.1	2.8	1.4	6.07	2.5	0.71	2.1	1.07	0.71
<i>Bact. paratyphosum B</i>	11.4	6.07	2.8	7.5	5.7	2.5	5.0	0.35	0.35

care was taken to maintain the cultures in the smooth phase. The antigens were prepared in bulk in amounts sufficient to last for about three months and were kept in a refrigerating machine. Thick 'O' suspensions were preserved in 66 per cent glycerine and were diluted, when required, with normal saline. The final opacity was adjusted to 1,000 millions per c.cm. The first hundred sera were tested against all eight suspensions, but as we failed to obtain any significant agglutination with suspensions 4 and 8, these were omitted from the test, leaving the three 'H' suspensions and three 'O' suspensions of *Bact. typhosum*, *Bact. paratyphosum A* and *Bact. paratyphosum B*. It is probable that the

occupational groups—labouring and non-labouring classes. In the labouring class are included menials and persons of the lower strata of life, others of a better social status are included in the non-labouring class. None of these patients had received prophylactic inoculation with any of the typhoid-paratyphoid group of organisms, so that in the present series we have not to contend with any agglutinins resulting from inoculations. Agglutinins present in the sera are the result of natural infection. Every possible care was taken to obtain a reliable history of each patient in order to exclude previous enteric infection. In a few we obtained past history of continued fevers suggestive of enteric

TABLE V

The percentage of sera in different age groups showing agglutinins ('H' only, 'O' only and both 'H' and 'O') for Bact. typhosum, Bact. paratyphosum A and Bact. paratyphosum B

Age groups	Number of persons examined	Number showing agglutinins	Percentage positive at 1 in 25 or over	SHOWING BOTH 'H' AND 'O' AGGLUTININS							
				'H' ONLY			'O' ONLY				
				25 and over	50 and over	100 and over	25 and over	50 and over	100 and over		
<i>Agglutinins for Bact. typhosum</i>											
0-10 years	15	4	26.6	20.0	13.3	0.0	0.0	0.0	6.6	0.0	0.0
11-20 "	49	11	22.2	8.1	4.08	0.0	8.1	4.08	6.1	6.6	0.0
21-30 "	112	24	21.4	11.6	5.3	1.8	6.2	5.3	3.5	6.1	2.0
31-40 "	60	19	31.6	18.3	6.6	3.3	11.6	5.0	0.9	3.5	0.0
41-50 "	30	9	30.0	16.6	6.6	3.3	10.0	0.0	0.0	1.6	0.0
51 years and over	14	4	28.5	14.2	14.2	0.0	14.2	7.1	3.3	3.3	3.3
									0.0	0.0	0.0
<i>Agglutinins for Bact. paratyphosum A</i>											
0-10 years	15	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-20 "	49	3	6.1	6.1	2.0	0.0	0.0	0.0	0.0	0.0	0.0
21-30 "	112	8	7.1	5.3	2.7	1.8	0.9	0.9	0.9	0.0	0.0
31-40 "	60	6	10.0	8.3	1.6	0.0	1.6	0.0	0.0	0.9	0.0
41-50 "	30	3	10.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0
51 years and over	14	0	0.0	0.0	0.0	0.0	0.0	0.0	6.6	6.6	3.3
									0.0	0.0	0.0
<i>Agglutinins for Bact. paratyphosum B</i>											
0-10 years	15	1	6.6	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0
11-20 "	49	4	8.1	2.0	2.0	0.0	6.1	0.0	0.0	0.0	0.0
21-30 "	112	12	10.7	7.1	6.2	2.7	2.7	0.9	0.9	0.0	0.0
31-40 "	60	12	20.0	10.0	6.6	1.6	6.6	0.0	1.6	0.9	0.0
41-50 "	30	2	6.6	6.6	3.3	0.0	0.0	0.0	3.3	3.3	0.0
51 years and over	14	1	7.1	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
									0.0	0.0	0.0

infection. In some individuals it was impossible to obtain satisfactory histories to exclude, with any degree of certainty, a previous enteric infection. Some of the patients at the time of collection of the sample were suffering from febrile diseases in no way suggesting enteric infections.

The individuals in our series cannot be taken to represent a sample of the normal population and indeed it would be difficult to define what would constitute a sample of the 'normal' population amongst the indigenous people of Calcutta. We have in our series of 280 individuals a 'cross section' of the type of persons seeking admission into hospital and all that we can claim for this series is that they represent a random sample of individuals admitted into hospital. We cannot apply our figures, based as they are on the examination of a series containing a number of sick persons, to the general population at large.

Only the two main groups, the labouring class and the non-labouring class (and this admittedly is a very arbitrary and in many instances an unsatisfactory method of classification), have been dealt with because the numbers of the various sub-groups are too small for any useful analysis.

The frequency of agglutinins for *Bact. typhosum*, *Bact. paratyphosum A* and *Bact. paratyphosum B* in different age groups is shown in the following graph. The actual percentages are recorded in table V.

It will be apparent that agglutinins are far more frequent for *Bact. typhosum* than for the paratyphoids. A study of tables IV, V, VI and

GRAPH I

The frequency of agglutinins ('H' and 'O' combined) for *Bact. typhosum*, *Paratyphosum A* and *B* in specified age groups.

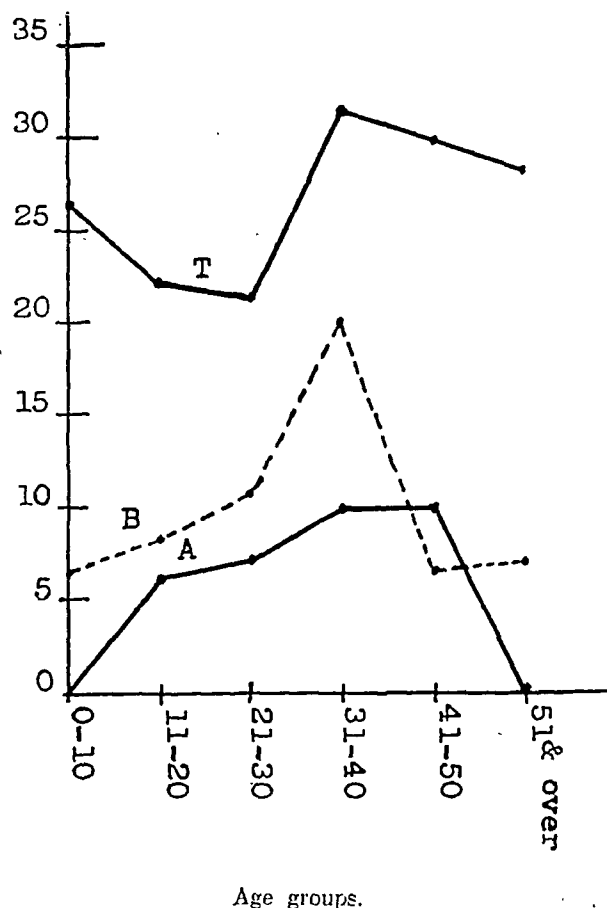


TABLE VI

Percentage of sera giving agglutination with different organisms and in different combinations

Typhosum only	Para A only	Para B only	Typhosum and para A	Typhosum and para B	Typhosum para A and para B	Para A and para B
18.5	2.8	6.4	2.1	2.5	1.8	1.07

TABLE VII

Number of sera showing different types of agglutinins

T(H)	T(O)	A(H)	A(O)	B(H)	B(O)	T(O) + T(H)	T(H) + A	T(H) + B(H)
30	15	5	1	10	7	7	1	3

T(H) + A(H) + B(H)	T(O) + A(H)	T(O) + B	T(O) + A + B	T(H.O.) + A(H) + B(H)	A(H) + B(O)	A(H) + A(O)	B(H) + B(O)	T(H.O.) + A
2	3	4	2	1	3	2	1	2

T = *Bact. typhosum*, A = *Bact. paratyphosum A*, B = *Bact. paratyphosum B*.
The type of agglutinin whether 'O' or 'H' is indicated in brackets.

VII will show that this difference is even more marked when the actual titres of 'H' and 'O' agglutinins are compared. The 'O' agglutinins for paratyphoid A are present only in a very small percentage whereas 'O' agglutinins for typhosum and paratyphosum B are more frequent, those for typhosum being the most frequent and present in higher dilutions of serum.

In tables VI and VII are given the relative frequencies of the different types of agglutinins.

The frequency of agglutinins for the enteric group of organisms in our two occupational groups, the labouring and the non-labouring classes, is shown in table VIII. In order to simplify the reading of results we have considered a serum showing agglutinins for any of the three organisms as positive for the enteric group. Tables VIII, IX and X are based on such figures.

TABLE VIII

Showing the frequency of agglutinins for the Bact. typhosum and Bact. paratyphosum A and B amongst the labouring and non-labouring groups of individuals examined

Class	Number of persons examined	Number positive in 1 in 25 or over	Percentage positive in 1 in 25 and over
Labouring class	176	70	40
Non-labouring class.	104	29	24

In table IX and graph II is given the frequency of agglutinins for the enteric organisms in the two classes of individuals according to different age groups.

TABLE IX

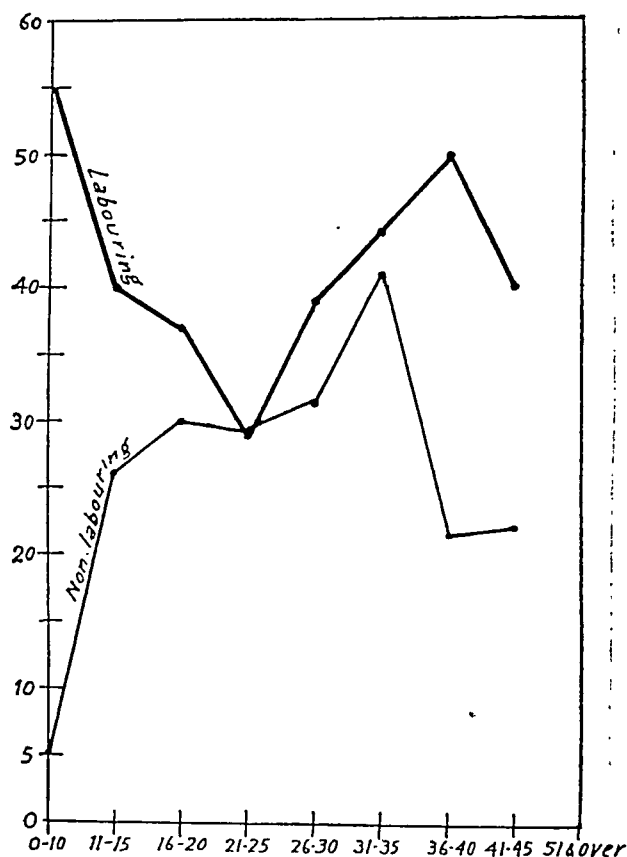
The percentage of sera showing agglutinins in 1 in 25 or over in various age groups in the specified class of persons

CLASS OF PERSON	LABOURING		NON-LABOURING	
	Number of persons	Percentage positive	Number of persons	Percentage positive
Age groups				
0-10 years	9	55.5	6	0.0
11-15 "	5	40.0	15	26.6
16-20 "	19	37.0	10	30.0
21-25 "	38	29.0	17	29.4
26-30 "	41	39.0	16	31.2
31-40 "	43	44.1	17	41.1
41-50 "	16	50.0	14	21.4
51-70 "	5	40.0	9	22.2

Although for an adequate analysis a far larger number of individuals must be examined for the results to have any statistical value, the results obtained in our present series and with our somewhat arbitrary classification suggest that infection with the enteric group of organisms,

GRAPH II

The percentage of sera showing agglutinins in 1 in 25 or over in various age groups in the specified class of persons.



Age groups.

as judged by the frequency of agglutinins, is far more prevalent in the labouring class than in those of higher social status. When we compare the different age groups in our two classes of individuals the differences in the percentages are even more marked. We see that in the first decade of life there is a large percentage of individuals in the menial and labouring class who show agglutinins for the enteric organisms in their sera, and that about adult life the curves in both series meet, suggesting that a large majority of us are infected with these organisms before we reach adult life. After the second decade the curves run parallel, the individuals in the labouring class showing the greater frequency. This is indeed what one would expect and anyone familiar with the deplorable conditions under which this class of person lives would hardly expect otherwise. Conditions in the 'bustees' and other overcrowded areas where the majority of the labouring class live are ideal for the spread of intestinal infection; there are

frequent chances of faecal contamination, and the surroundings are heavily polluted with man's own excrement.

The results of the serological tests, although admittedly of limited value, because of the small numbers on which some of the percentages are based, illustrate the marked frequency of infection with the enteric group of organisms. We believe that such surveys are of more value than the search for carriers; they demonstrate that actual infection of the body has at some time or other taken place and that this infection has resulted in the active participation of the body in producing active immunity of which the agglutinins are readily demonstrable and measurable, and are an index.

In table X the frequency of agglutinins against the enteric group of organisms in males and females is given. There is no statistically significant difference in the two sexes.

TABLE X

Showing the frequency of agglutinins for the Bact. typhosum, Bact. paratyphosum A and Bact. paratyphosum B organisms amongst the different sexes in the individuals examined

Sexes	Number of persons examined	Number positive to 1 in 25 or over	Percentage positive in 1 to 25 and over
Males ..	234	86	36.7
Females ..	46	13	28.2

In table XI is given the relative frequency of enteric agglutinins in individuals suffering from diseases other than enteric fever.

TABLE XI

Showing the frequency of agglutinins for Bact. typhosum, Bact. paratyphosum A and Bact. paratyphosum B in sera obtained from individuals suffering from diseases other than enteric fever

Conditions	Number of persons examined	Number positive to 1 in 25 or over	Percentage positive in 1 to 25 and over
Splenomegaly	18	2	11.1
Kala-azar ..	9	0	0.0
Anæmias ..	12	4	33.3
Non-enteric febrile cases.	52	15	28.9
Miscellaneous, febrile cases.	166	65	38.9
Malaria ..	23	13	56.5

Although rigid conclusions are to be deprecated because of the very small numbers of the various sub-groups examined, it is obvious that there is a real need for more information on the frequency and concentration of agglutinins in

persons suffering from various febrile conditions. The complete absence of agglutinins in patients suffering from kala-azar is striking, suggesting the paralysis or blockage of the antibody-producing system. These results also illustrate that there is no increase in the agglutinins in non-enteric febrile cases as compared with the afebrile individuals. This does not support the generally accepted view, that in febrile conditions non-specific stimulation of agglutinins occurs. This point is better illustrated when the results of the qualitative-receptor analysis of individual cases are studied. It is obvious that there is no appreciable difference in the frequency and titre of the 'O' agglutinins.

In table III we gave the results of various published reports of serological surveys that have been undertaken in different parts of the world. If we accept the view that the different frequencies in the so-called normal antibodies in different countries are correlated with the risk of infection to which different individuals are exposed we must conclude that the results reported in this paper suggest a far greater degree of prevalence of enteric fevers in Calcutta than in other parts of the world where

TABLE XII

Showing the comparative percentage of agglutinating sera in the uninoculated and inoculated in samples of population in (a) London compared to that of (b) Darjeeling and (c) Calcutta

Organisms	UNINOCULATED		INOCULATED	
	Number of sera examined	Per cent positive	Number of sera examined	Per cent positive
(a) Figures from Rosher and Fielden's (1922) survey in London				
<i>Bact. typhosum</i> ..	181	3.0	149	89
<i>Bact. paratyphosum A</i>	181	0.0	149	58
<i>Bact. paratyphosum B</i>	181	4.0	149	71
(b) Figures from a survey in Darjeeling				
<i>Bact. typhosum</i> ..	85	32.0	31	84
<i>Bact. paratyphosum A</i>	85	9.0	31	64
<i>Bact. paratyphosum B</i>	85	25.0	31	84
(c) Calcutta				
<i>Bact. typhosum</i> ..	280	28.2	..	..
<i>Bact. paratyphosum A</i>	280	7.1	..	..
<i>Bact. paratyphosum B</i>	280	11.4	..	..

such surveys have been conducted. This is illustrated better in table XII which compares the results obtained in London with the results obtained in Calcutta and in Darjeeling. The figures for Darjeeling are based on an investigation carried out by one of us (C. L. P.) in 1934. Sera from 116 individuals were examined for the presence of agglutinins of the typhoid-paratyphoid group of organisms.

We have not examined any individuals in Calcutta who had been inoculated with T.A.B. vaccine. When we compare the results of our series of inoculated individuals examined in Darjeeling with a similar group in London, we find no significant difference in the results obtained, in fact the similarity of the percentages is remarkable. Of the uninoculated the percentage of those showing agglutinins for the typhoid-paratyphoid group of organisms is considerably higher in Darjeeling and Calcutta than a similar group from the frequencies obtained in London and is striking. One is irresistibly led to the conclusion that infection with these three main species of enteric organisms is far more prevalent in our sample of population than in London.

Conclusions

Serological surveys for the determination of infection in any given community are valuable. They yield useful information, are comparatively easy to conduct and are particularly suited to conditions in India where very often the laboratory is situated at some distance from the actual place where such an investigation is desired. Although considerable discrepancies exist in the opinions held concerning the relationship between so-called 'normal' and immune agglutinins, a knowledge of the type of agglutinins, whether 'H' or 'O', their frequency and concentration in individuals differentiated by age, occupation, social status and other factors would be of the utmost value and is urgently needed in India. Such surveys would be of great practical value in determining areas of endemicity and eventually in assessing the value of any preventive measures. Further, when it is realized that sub-clinical infections are not uncommon particularly in regions where enteric fevers are endemic, it will be readily understood how essential it is to determine the prevalence and the exact nature of the organism or organisms concerned.

Here we would stress two points that have not received sufficient attention in many bacteriological laboratories in India. Firstly, the old-fashioned Widal reaction is full of many pitfalls and is of limited value. The qualitative-receptor-serological analysis of Weil and Felix particularly for the diagnosis of enteric fevers has received little attention in this country. There is no need to describe here the principles and technique of this comparatively new diagnostic method. These can be found in

any standard textbook and a vast literature is available on the subject. There can be no doubt that the claims advanced in favour of this method have been amply confirmed by many workers. There is no justification, whatsoever, in the retention of the old Widal reaction either in the sero-diagnosis of enteric fevers or in the determination of so-called normal agglutinins. Secondly the limit of agglutinins is directly dependent on the sensitiveness of the antigens employed and it is essential for the results to be comparable, and this indeed is the first desideratum in serological surveys, that some uniformity in the methods and antigens employed be obtained. There is a real need for a central co-ordinating committee which will lay down standard methods and guide workers in the planning and execution of serological surveys.

Summary

(1) The value of qualitative-receptor analysis of Weil and Felix for the determination of so-called normal agglutinins for the enteric group of organisms is stressed.

(2) A series of sera from 280 patients suffering from various non-enteric infections have been examined for 'O' and 'H' agglutinins for *Bact. typhosum*, *Bact. paratyphosum A* and *Bact. paratyphosum B*. The results obtained have been analysed and the available data suggest that the infection with these three principal organisms of the typhoid-paratyphoid group is common in Calcutta.

(3) The importance of serological surveys to map out the degree of infection in different parts of India and in different occupational and social strata is stressed.

(4) Suggestion is made that for such serological surveys to be of real value, some uniformity in the suspensions used and the methods employed in the different laboratories should be arrived at.

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TUBERCULOSIS IN SOME RARE SITUATIONS, NAMELY TONSILS AND UTERUS

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OUR choice of the title of this paper is not a very happy one, but may be justified on the ground that its splitting would reduce the papers to very small dimensions.

PART I

Incidence and Histopathology of Tonsillar Tuberculosis

Tuberculosis of the tonsils is by no means a common condition, Mullin (1923), for example, in analysing 400 tonsillectomies found only 4.25 per cent cases of tuberculous tonsils.

The present study is based on 2,477 tonsillectomies in the Madras General Hospital. This

(Continued from previous page)

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series covers a period of five years from January 1928 to December 1932. We, however, feel that this investigation is incomplete in many respects; for example, there are no clinical details, and no bacteriological examination was made of the tonsils. It would undoubtedly have been more valuable if the incidence of the various types of *B. tuberculosis* had been worked out. But situated as we are, we could not carry out such enquiries. A very large number of persons come to the outpatient department and the patients leave the hospital soon after the operation. These tonsils are sent to the laboratory without any clinical history. We fully realize that information regarding the condition of the lymph nodes and the lungs would have been extremely useful inasmuch as it would have enabled us to establish the relationship between the incidence of tuberculous tonsils and tuberculosis of other parts of the body. As a very large number of tonsils are received for examination, no special investigations were carried out and only histological examinations were made. As will be seen in the table, only a very small proportion of the tonsils show histological evidence of tuberculosis. As this lesion is not recognizable clinically, it would have been necessary to submit thousands of the tonsils to bacteriological examination, such as animal inoculation and cultural tests. Such an investigation besides being very expensive would have entailed an enormous amount of labour.

Naked-eye examination

The tonsils were carefully examined before they were sectioned but in no case was it possible to identify the tonsil as tuberculous before it reached the microscope. The tonsils which turned out to be tuberculous on histological examination did not show any difference in size, colour, or appearance from the non-tuberculous ones. Fordyce and Carmichael (1914) have often found these tonsils to be small, ragged and atrophic. Though such an appearance was not noted in our series of cases, tonsillar tuberculosis being chronic in type and leading to fibrosis, one would naturally expect them to be small in size as the result of the contraction of fibrous tissue. It may be that in none of the cases of the present series had the fibrotic process advanced far enough to cause shrinkage. No case of ulceration was seen; even tonsils showing histologically an advanced degree of tuberculosis were free from it.

Histological examination

In the following paragraphs, the histological appearances of the tonsils in a few cases are described:—

Case I.—(Section No. 3910). The section shows a number of discrete typical tuberculous follicles under the squamous epithelium which is nowhere destroyed. These follicles which are situated in between the hyperplastic germinal centres consist of clusters of endothelial cells which are also known as epithelioid or

reticular cells and giant cells with a peripheral zone of small lymphocytes. There is no necrosis of the central zone and there is no increase of fibrous tissue.

Case II.—(Section No. 5040). The tuberculous follicles in this section are seen to have become confluent. Giant cells are also seen. Under the surface epithelium numerous hyperplastic germinal centres are noticed. The reticular cells and giant cells are situated deep down near the capsule which is thickened. There is marked infiltration of the tonsil with plasma cells. There is necrosis as shown by the loss of the cellular outlines of the reticular cells. There is no increase of fibrous tissue. This appears to represent a more advanced stage than the last section.

Case III.—(Section No. 4820). This section presents the appearance of formative or proliferative type of tuberculosis as seen in the lymph nodes. There are a number of cellular areas which stain differently from the rest of the tonsillar substance, i.e., they are eosinophilic. Under high magnification these cell groups are found to consist of reticular cells. There are no giant cells and the lymphocytic peripheral zone is also not very prominent. There is no necrotic change in the reticular cells. The germinal centres appear normal in size. There is a considerable increase of fibrous tissue.

Case IV.—(Section No. 5768). There are a few typical tuberculous follicles in contact with the surface epithelium, separated from one another, showing a slight amount of necrosis. There is an enormous increase of fibrous tissue in the tonsillar substance. Lymphoid tissue is atrophied.

Case V.—(Section No. 5316). The surface epithelium is much thinned out but not broken through. There is a diffuse hyperplasia of reticular cells without any definite follicular arrangement, amongst which a number of giant cells are seen. There is no evidence of fibrosis or caseation. The germ centres are atrophied.

Case VI.—(Section No. 4932). Numerous tuberculous follicles, some of which are confluent and others discrete. The germ centres are very active and no giant cells are seen.

Case VII.—(Section No. 3424). Numerous confluent areas of hyperplastic reticular cells; no necrosis or fibrosis.

Case VIII.—(Section No. 9042). Many tuberculous follicles; no necrosis or fibrosis.

Bacteriological examination

All the sections were stained by Ziehl-Neelsen's method and examined for *B. tuberculosis*, but in no case were these found.

Discussion

In 2,477 cases (males 1,249 and females 1,228) in which operation was performed for removal of the tonsils, histological evidence of tuberculosis was found in 15 cases, or 0.6 per cent of all cases. The percentage incidence of tuberculous tonsillitis in males was 0.4 and in females 0.8. According to age and sex, the incidence is as follows:—

Age	NUMBER OF CASES	
	Males	Females
1 to 5 years ..	nil	1
6 to 10 " ..	3	1
11 to 15 " ..	nil	nil
16 to 20 " ..	1	5
21 or over " ..	2	3

There were 10 females and 5 males, a proportion of 2 females to 1 male. The disease is

definitely much more frequent in females than in males after 15 years of age. This appears to be in accord with the observation made by many workers in India that pulmonary tuberculosis is more common among females than males. The maximum incidence is between the ages of 16 to 20. The youngest patient was 5 years of age and the oldest 26 years of age. Both were females.

It may be noticed that no case of tuberculous tonsillitis was found between the ages of 11 to 15 years but this is probably without any significance.

Histopathology.—The tuberculous process begins in the form of one or two discrete tubercles beneath the epithelium of surface and crypts. These gradually enlarge, become confluent, and extend into the substance of the tonsil until a great part of it is replaced by tuberculous tissue. It is a noteworthy fact that though the tubercles may lie near the epithelium they never actually invade it and it is for this reason that ulceration does not occur. It may also be noticed that caseation is not a very important feature of tonsillar tuberculosis. In only two cases was evidence of commencing necrosis found, but it was not at all marked. In most of the cases, proliferation of the reticular cells and fibroblasts was very pronounced. It is not possible to explain the remarkably different character of the tuberculous lesion of tonsils—different from that of the lymph nodes, for example, which undergo extensive caseation. It may be that the proliferative type and the fibrotic type of tuberculosis are met with in those tissues which are resistant to the destructive action of the bacilli and their toxins. Situated as the tonsils are in the common portal of entry to the respiratory and gastro-intestinal tract they are presumably infected with *B. tuberculosis* in a great many cases, but, as they withstand the action of the tubercle bacilli so well, they seldom present clinical evidence of the lesion. Histological evidence points to the fact that the ultimate tendency of the tuberculous lesions in the tonsils is towards recovery. In the routine examination of the tonsils, we have come across numerous instances in which widespread fibrosis was present and these might well represent an extinct tuberculous infection though, of course, there are no means of confirming this. Tuberculous infection may spread to the peritonsillar tissues causing peritonsillitis, which is clearly seen in our case II.

The material for this study came into our hands through the courtesy of Mr. P. V. Cherian, F.R.C.S.E., to whom our thanks are due.

PART II

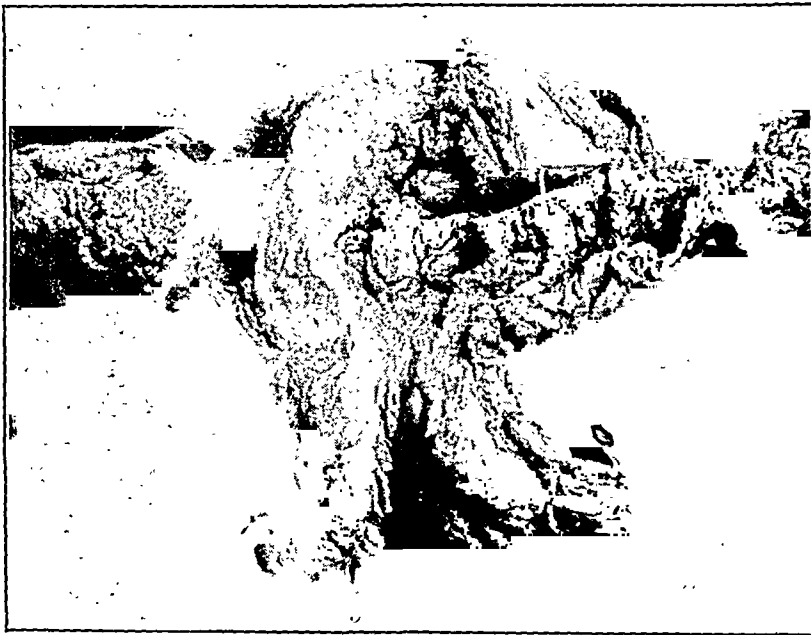
Histopathology and Clinical Features of Tuberculosis of Uterus

Reports of cases

Case I. Clinical history.—Patient M, female, aged 25 years, was admitted into the Clough Memorial

Hospital, Ongole, with a complaint of prolapse of the uterus (duration two years) and serosanguineous discharge (duration six months). On examination there was ulceration of the cervix unlike that due to carcinoma. At operation, the peritoneal surface was covered with fine nodules but the absence of any primary tumour was against the diagnosis of carcinomatosis. The pouch of Douglas was obliterated by adhesions. The Fallopian tubes and ovaries were adherent to a mass of tissue. One of the tubes showed definite tubercles. The uterus along with the adnexa of both sides were removed.

Naked-eye examination.—On opening the uterus a soft raised ulcerated mass is found in the fundus and body of uterus without any extension to servix (Fig.). The uterus is normal in size and soft.



An irregularly raised mass is seen occupying the fundus of the uterus.

Microscopical examination.—(Section No. 2358). Under low power there is thickening of the endometrium. In one part of the section the uterine glands are absent and the endometrium is replaced by tuberculous granulation tissue. The surface epithelium is ulcerated. In other areas the glands appear normal without any hyperplastic changes. A few of the glands are distended and the lumen contains a hyaline secretion and a good number of large oval cells with a clear cytoplasm and peripheral nucleus. There are commencing areas of necrosis as seen by loss of cellular outline. There is no definite caseation. Giant cells of Langhans' type are present. There is marked infiltration of stroma with plasma cells and lymphocytes. There is neither stratification of glandular epithelium nor obliteration of the lumen. The myometrium shows definite tuberculous follicles between the muscle bundles but without caseation. The blood vessels show endarteritis obliterans.

Case II. Clinical history.—Patient D, female, aged 25 years, gained admission to the Clough Memorial Hospital, complaining of leucorrhœa and amenorrhœa of two years' duration. There was no disease of the lungs. A fluctuant fixed mass was felt in the right groin, believed to be a cold abscess resulting from the breaking down of tuberculous groin glands. An irregular ulcerated soft mass was protruding from cervix with no special tendency to bleeding. At operation, the tubes and ovaries presented the picture of advanced pelvic inflammatory disease. The adnexa of both sides were removed with the uterus, including the cervix and a small cuff of vagina. There was a profuse discharge from the cervical canal during operation. The patient died three days later with the evidence of general septic peritonitis.

Microscopical examination.—(Section No. 1542). Section of cervix shows ulceration of

surface epithelium, the cervical mucous membrane being almost entirely replaced by tuberculous granulation tissue with many giant cells. A few atrophic glands are seen. The muscular layer shows many tuberculous follicles and round cells. The blood vessels show definite endarteritis obliterans. Both ovaries are free from tuberculosis.

Case III. Clinical history.—Patient C, female, aged 23 years, married, has three children, the last child was born 2 years and 6 months before the date of admission to the hospital. She entered the Government Women and Children Hospital, Madras, on 25th January, 1935, complaining of pain on the right side of lower abdomen for four days, and fever of fifteen days' duration. For one year she has been having regular, painful and profuse periods, lasting for nine days. She has been suffering from leucorrhœa for the last two years. On examination, the cervix was found to be eroded, and the uterus slightly bigger than normal, and firm. There was tenderness in the region of the left Fallopian tube. The right ovary was palpable. It was diagnosed as a case of sub-involution and salpingitis. On 9th February

the uterus was dilated and curetted. On 21st February total hysterectomy was done and the tubes were found to be thickened and nodular. The ovaries were found to be covered with fine tubercles.

Naked-eye examination.—No gross lesion is found in the uterus or appendages.

Microscopical examination.—(Section No. 333). A section of the uterus shows the endometrium to be normal. There are typical tuberculous follicles situated in between the muscle bundles in close relation to blood vessels. There is no necrosis. A section of the ovary shows a large follicular cyst, but there is no evidence of tuberculosis. The wall of the Fallopian tube is slightly fibrotic and shows general thickening of the mucous membrane. The epithelium is intact. The serous surface shows a tuberculous nodule consisting of confluent tubercles. The central necrosis is well marked. The lumen of the tube is obliterated by the proliferation of the epithelium.

Case IV. Clinical history.—Patient K, female, aged 20 years, was admitted to the Government Women and Children Hospital, Madras, on 17th July, 1935. She was married seven years before the date of admission and one year later had a child. She complained of white discharge *per vaginam* since the birth of her child, and slight bleeding for one year. The periods were regular but very scanty, lasting only for one day, and she complained of slight pain in the back during the periods. On examination, there was a small ulcerated cauliflower-like growth on the right side of the cervix, which easily bled on manipulation. The growth extended to the anterior fornix of the vagina. On 29th July total hysterectomy and right salpingo-oophorectomy was done. A few nodules on the uterus, right Fallopian tube and on the intestines were noticed. The right ovary contained a hæmorrhagic cyst of the size of a lime.

Microscopical examination.—(Section Nos. 1735 and 1736). Section of the cervix showed typical tuberculous follicles situated in the stroma between the glandular acini. There is no evidence either of necrosis or of hyperplasia of the glandular epithelium. Section of growth from the anterior fornix showed tuberculous granulation tissue.

Case V. Clinical history.—Patient S, female, aged 25 years, had a child five years before the date of admission to St. Martin's Hospital, Ramnad. Her chief complaint was leucorrhœa and amenorrhœa of two years' duration. The cervix was eroded and bled readily when touched. The uterus was normal in size and position. The surgeon was inclined to think that the appearance of the cervix was not that of a typical erosion and he removed a wedge-shaped slice of the cervix bearing the erosion.

Microscopical examination.—(Section No. 7575). Section of the cervix shows ulceration of surface epithelium. Many confluent tuberculous follicles are seen in the fibro-muscular tissue with a large number of giant cells. There is no necrosis or caseation. There is no evidence of proliferative activity of the glandular epithelium.

Case VI. Clinical history.—Patient M, aged 26 years, was admitted into the Government Women and Children Hospital, Madras, on 22nd August, 1934, with

a complaint of complete amenorrhœa of four years' duration. She was married five years, had no children. The periods used to be regular till four years before admission to the hospital. The general condition of the patient was fair and nothing abnormal was noticed in the circulatory or respiratory system. On local examination, there was an ulcer on the cervix.

Microscopical examination.—(Section No. 1705). Section of cervix shows an ulcer subjacent to which is seen tuberculous granulation tissue with areas of necrosis. The glandular acini are almost completely atrophied. The small blood vessels of the muscular layer show perivascular round-cell infiltration.

Case VII. Clinical history.—Patient S, female, aged 32 years, sought admission into the Government Women and Children Hospital, Madras, on 2nd December, 1935, with a complaint of irregular bleeding *per vaginam* alternating with leucorrhœa for a period of five months. She was married eighteen years before admission to the hospital and had five children, the last child being six years of age. She was very anæmic and poorly nourished. She gave a history of a swelling in the neck six years ago which burst leaving a visible scar at the site of the swelling (caseating tuberculous glands?). On physical examination of the chest a few râles were heard in the right apex. There was no definite dullness. A skiagram of the chest revealed nothing abnormal in lungs. Local examination of the cervix revealed an irregular hard ulcer of both lips extending into the right lateral fornix. The margins of the ulcer in some places were sharply defined and were not specially friable. The uterus was enlarged and retroverted. On rectal examination, a certain amount of infiltration was felt in both broad ligaments.

Microscopical examination.—(Section No. 2815). Section of the cervix shows ulceration of the mucous membrane at one part with subjacent fibro-myomatous tissue. Scattered here and there are seen typical tuberculous follicles with very little necrosis. Most of these are seen at considerable depth in the tissue. Groups of round cells and plasma cells are seen throughout the section.

Case VIII. Clinical history.—Patient A, female, aged 20 years, was admitted in the Government Women and Children Hospital, Madras, on 26th November, 1935, with a complaint of leucorrhœa and scanty but prolonged periods for two years, the periods lasting for about fifteen days. She was also suffering from attacks of pain in the right iliac fossa with vomiting. Her general condition was fair though anæmic. Physical examination of heart and lungs revealed nothing abnormal. On local examination, the cervix was found to be hard and hypertrophied with a number of nodules on it. The uterus was retroverted, bigger than normal, freely movable and tender. The right ovary was prolapsed.

Microscopical examination.—(Section No. 2716). Section of the cervix shows at one part a lining of columnar epithelium with subjacent dense fibrous tissue and involuntary muscle tissue. Numerous hyperplastic tuberculous follicles are seen densely packed in the sub-epithelial tissues. There is marked proliferation of endothelioid cells with complete absence of necrosis.

Discussion

Tuberculosis of the uterus is a rare affection. It is most common in adults, the average age

incidence in our collection of cases being 28 years. The age, symptoms, etc., of the cases are shown below :—

duced into the peritoneal cavity found their way into the uterus and vagina through the Fallopian tubes. The possibility of the spread

Serial number	Age	Symptoms and duration	Pre-operative diagnosis	Evidence of tuberculosis apart from uterus
1	55	Serosanguineous discharge (6 months).	Tubercle or cancer	Peritoneum and fallopian tube.
2	25	Leucorrhœa and amenorrhœa (2 years).	Tubercle	Groin glands.
3	23	Profuse painful periods (1 year).	Chronic endometritis	Fallopian tube.
4	20	Bleeding (1 year), leucorrhœa (6 years).	Malignant	Intestines and fallopian tube.
5	25	Leucorrhœa and amenorrhœa (2 years).	Do.	<i>Nil.</i>
6	26	Leucorrhœa and amenorrhœa (5 years).	Do.	<i>Nil.</i>
7	32	Bleeding and leucorrhœa (5 months).	Malignant and tubercle	Glands neck.
8	20	Scanty but prolonged periods (2 years).	Malignant	<i>Nil.</i>

Clinically the most common symptom is leucorrhœa even though some of the patients complained of amenorrhœa and others of bleeding *per vaginam*. The duration of the symptoms varied from a period of five months to six years. There was histological evidence of tuberculous cervicitis in all cases except one (case I). Cases III, V and VI showed an ulcerative condition of the cervix which simulated cervical erosion. In two cases (II and IV) there was an ulcerated cauliflower-like growth in the cervix which very much resembled a malignant growth. As a matter of fact the pre-operative diagnosis in most cases was that of malignant disease. This shows that histological examination of the affected tissue is of particular importance in the correct diagnosis of uterine tuberculosis, since there are no definite clinical signs or symptoms pathognomonic of this disease. Evidence of abdominal tuberculosis was present in cases I and IV, whereas in case III, apart from tubercles on Fallopian tubes, no other focus was discovered. In case II there was a cold abscess in the right groin even though there was no disease of the respiratory system. There was a history of old glandular tuberculosis in case VII. In cases V, VI and VIII there is no evidence of any other focus of tuberculosis apart from cervix and the possibility of primary tuberculosis of this tissue is to be considered. The mode of infection in cases of primary tuberculosis is uncertain and on account of lack of clinical data we are not able to trace the infection in these cases to infection by coitus from genito-urinary tuberculosis. The uterine infection in case I is obviously secondary to peritoneal infection. The infection might have spread from the peritoneum to the uterine mucosa *via* the Fallopian tubes as suggested by the experiments of Pinner, who showed that

fine particles of cinnabar or lamp black introduced through the entire thickness of the uterine wall is remote. Case III is an example of miliary type of tuberculosis. The endometrium is not affected at all and the myometrium shows miliary tubercles in close relation to blood vessels, suggesting a hæmatogenous spread.

Histologically, in early cases the tubercle follicles are situated beneath the surface epithelium in the stroma between the glandular acini. These gradually coalesce, undergo caseation and cause ulceration of the surface epithelium. A rare interstitial type has been described in which there is a diffuse enlargement of cervix with intact surface epithelium (Frank). Case VIII illustrates such a type. It has been noted by some authors, particularly by von Franque, that in tuberculosis of the cervical mucosa there is stratification of glandular epithelium and obliteration of the lumen of the acini. This has not been observed in our cases.

Summary

The first part of this paper is based on a study of fifteen cases of tuberculous tonsils met with in a series of 2,477 tonsillectomies. The incidence and histopathology are discussed.

The second part is devoted to the study of eight cases of tuberculosis of the uterus. The clinical features and histopathology of these cases are described as fully as possible.

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NOTES ON PNEUMONIA IN A TEA GARDEN IN ASSAM

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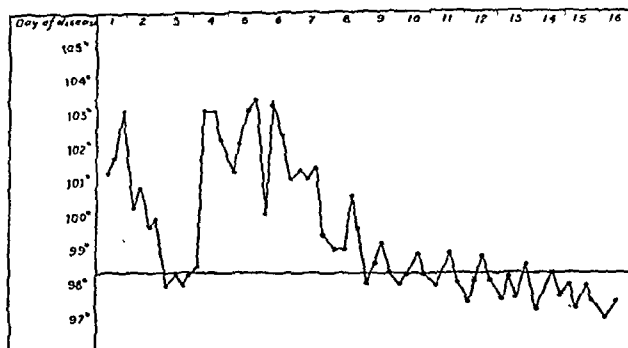
DURING a period of 5 years from January 1930 to December 1934, 242 cases of pneumonia were treated in this hospital. Of these, 7 were of larval type with indefinite lung signs. Two other cases manifested all the characteristic features of lobar pneumonia, except that no lung signs could be elicited. They were diagnosed as central pneumonia and both of them died. No post-mortem examination could be held to confirm the diagnosis. These 9 cases have been excluded and the remaining series of 233 cases which had definite lung signs have been analysed and the observations briefly recorded in the following pages.

It is not the object of this paper to give a full description of the disease but only the points of interest that have emerged and the experience that has been gained in dealing with these cases have been communicated. The population from which the patients have been drawn and the houses they lived in as well as their economic condition were such as are found in an average tea garden of Assam. With the advent of the cold season the manager of this garden advances warm blankets and coats to the big and needy families as a precautionary measure against pneumonia.

Classification.—It has appeared to me that a strict clinical distinction between lobar and broncho-pneumonia is not always possible. Moreover atypical cases are far more common than the classical lobar and broncho-pneumonias of the textbooks. These atypical cases are usually ushered in with fever, cough, bad headache, pain in the whole body or joints and running from eyes and nose. The temperature generally continues for 2 or 3 days, then drops to normal and remains there for one or two days when the patient feels better, though somewhat exhausted. Then there is a sharp rise of temperature again with pain in the chest, return of headache and aggravation of cough which is often hacking and persistent in character. The sputum is often purulent, sometimes frothy, yellow or greenish yellow. Either one or both the lungs now show crepitations, most commonly at the base or bases, which extend upwards and run to consolidation. The temperature continues, though irregularly, and ultimately comes down to normal, usually by lysis and rarely by crisis. This type of case is demonstrated in chart 'A'. There is another group in which the onset is the same but there is no intervening drop of temperature. The chart is more irregular and the lung signs appear in a day or two. This is demonstrated in chart 'B'. There is yet another group, though a small one, in which patients are admitted with vomiting and purging,

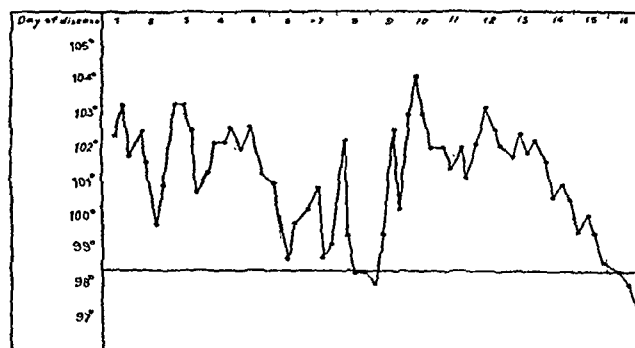
sometimes in a semi-collapsed condition with a subnormal temperature and a feeble pulse. They are primarily diagnosed as acute enteritis and some of them require subcutaneous saline. In

CHART A



two or three days' time they get fever, cough and chest pain, and develop pneumonia of one or both lungs, and run an irregular temperature ending by lysis. When all the clinical pictures present

CHART B



in these cases are weighed-up, it becomes very difficult for the attending physician to place them in any of the categories of the classical pneumonias.

Some might like to call them mixed-infection pneumonias but I prefer to classify them as influenzal pneumonia, based on the modes of onset, the type of pyrexia, the character of symptoms and physical signs, the duration of the disease and the mode of defervescence. According to the best of my judgment, these cases of influenzal pneumonia markedly outnumber those of typical lobar and broncho-pneumonia.

OBSERVATIONS

Incidence of various types.—Table I shows the relative incidence of the three types of

TABLE I
Showing types of cases

Types	Number of cases	Percentage
Lobar	68	29.1
Broncho	29	12.4
Influenzal	136	58.3
TOTAL	233	..

pneumonia treated in this hospital. It is evident that the influenzal types are much higher than the other two types separately and even taken together. Broncho-pneumonia mostly affected children below 5 years of age but adults were not exempt. Both in broncho- and influenzal pneumonia there was not much alteration of pulse-respiration ratio. Even in a few cases of lobar pneumonia with definite consolidation pulse-respiration ratio was hardly altered, which denoted low toxicity and terminated in rapid

of life, both in males and females, leading to exertion, excesses and exposure to infection.

Incidence by months.—Table III shows the monthly incidence of the disease. It is noted that no month is exempt and that the cases are highest in number in May and August. At the end of April the coolies enjoy 'Fagua' holidays. The large number of cases in May is the outcome, it seems, of exposure along with alcoholic and other excesses committed during 'Fagua'. In August there is heavy rainfall and the people

TABLE II
Showing age and sex incidence

	AGE GROUPS									TOTAL	Per cent
	Below 1 year	1-5	5-10	10-20	20-30	30-40	40-50	50-60	60 and over		
Male ..	11	13	7	16	34	38	28	7	1	155	66.5
Female ..	3	18	7	15	14	16	2	2	1	78	33.4
GRAND TOTAL ..	14	31	14	31	48	54	30	9	2	233	..

TABLE III
Showing incidence by months

Months	YEARS					TOTAL	Per cent
	1930	1931	1932	1933	1934		
January ..	4	8	2	9	2	15	10.7
February ..	1	2	5	5	..	13	5.5
March ..	2	..	7	2	4	15	6.4
April ..	2	..	3	7	3	15	6.4
May ..	1	2	4	5	16	28	12.8
June ..	1	..	4	2	5	12	5.1
July ..	2	2	4	2	4	14	6.0
August ..	2	5	12	5	15	39	16.7
September ..	7	..	4	3	6	20	8.5
October ..	4	3	5	5	7	24	10.3
November ..	2	4	6	2	3	17	7.2
December ..	2	2	5	..	2	11	4.7
GRAND TOTAL ..	30	28	61	47	67	233	..

recovery. Apical pneumonia was very rare, only 4 such cases being found in the whole series, 3 of them being children and 1 an adult. It must also be noted that toxicity does not necessarily depend on the extent of lesion. I have seen cases with insignificant lesions having highly toxæmic symptoms and cases with extensive lesions showing little or no toxæmia.

Age and sex incidence.—Table II shows the incidence by age and sex. It is manifest from this table that males are more affected than females. This is due, I think, to the more strenuous and exposed life the males are bound to live and to their greater indulgence in alcohol. It is also noticed that the number of cases are highest between 10 to 50 years of age. This is natural because this is the most active period

are compelled to work outdoors, wet all over throughout the day. This, I think, leads to the heavy pneumonic incidence in August.

Lung involvement.—Table IV shows the relative involvement of the lungs. It is noted that the right lung is most affected.

TABLE IV
Showing lung involvement

Lungs involved	Number of cases	Percentage
Right lung ..	101	43.3
Left lung ..	70	30.0
Both lungs ..	62	26.6
TOTAL ..	233	..

Duration of pyrexia.—Table V shows the duration of temperature in days. Broncho-pneumonia had the longest duration and lobar the shortest. In taking this average, the patients who died during pyrexia or false crisis have been excluded. The average has been taken of those cases only who had real crisis or lysis.

TABLE V
Showing duration of temperature in days

Types	Average duration in days	DURATION IN DAYS	
		Maximum	Minimum
Lobar ..	6.2	16	3
Broncho ..	12.6	37	10
Influenzal ..	7.2	20	3
TOTAL AVERAGE ..	8.6	24.3	5.3

MORTALITY

Mortality by age and sex.—Table VI shows mortality by age and sex. It is found that the death rate is higher in females than in males, and that taking both sexes together it is highest in extremes of life. It is also noted that in age group 5 to 10 years the death rate is nil. This is in conformity with the observations of Leslie (1924) who mentions a very low death rate in this age period.

TABLE VI
Showing mortality by age and sex

		AGE GROUPS									TOTAL	Per cent
		Below 1 year	1-5	5-10	10-20	20-30	30-40	40-50	50-60	60 and over		
Total deaths in each age group.	Male ..	5	4	nil	3	7	11	8	2	nil	40	25.8
	Female ..	1	2	nil	6	5	7	nil	nil	1	22	28.2
Percentage of deaths in each age group.	Male ..	45.4	30.7	nil	18.7	20.5	28.9	28.5	28.5	nil	..	..
	Female ..	33.4	11.1	nil	40.0	35.7	43.7	nil	nil	100.0	..	..

Mortality and types of pneumonia.—Table VII shows mortality according to types of

TABLE VII
Showing types and mortality

Types	Number of cases	Number of deaths	Percentage
Lobar ..	68	26	38.2
Broncho ..	29	10	34.4
Influenzal ..	136	26	19.1
TOTAL ..	233	62	26.6

pneumonia. The lobar type shows the highest mortality and the influenzal the least. This is contrary to the opinion of Leslie who states that the death rate in influenzal pneumonia is higher than that in the other two types.

Mortality and lobar involvement.—Table VIII shows the mortality according to lobar involvement. It is obvious from this table that the greater the number of lobes affected, the higher the death rate.

TABLE VIII
Showing mortality and lobar involvement

Number of lobes involved	Number of cases	Number of deaths	Percentage
One lobe ..	73	13	17.8
Two lobes ..	84	23	27.3
Three lobes ..	40	13	32.5
Over three lobes	36	13	36.1
TOTAL ..	233	62	26.6

Mortality and day of admission to hospital.—Table IX shows the mortality according to the day of admission of the patients to hospital. This table clearly demonstrates the necessity of admitting patients early. But one thing must be remembered. They should never be allowed to walk to the hospital. In this garden it is

the custom to bring the patients to hospital either on a trolley or in a lorry slowly driven, from which they are carried to bed on a stretcher.

PROGNOSIS

It is my deep-rooted impression that it is not wise for a physician to predict a prognosis as to recovery or death in acute cases of pneumonia. I have seen very bad cases recover when all hopes of cure had been given up and again apparently good cases die when death was never expected. But some general points can be laid down. In one word, the degree of toxæmia gives the most important indication for prognosis. The favourable signs are (1) ability to

TABLE IX
Showing mortality and day of admission to hospital

	DAY OF DISEASE ON ADMISSION								TOTAL
	1	2	3	4	5	6	7 and over	Not definitely known	
Number of cases admitted.	138	26	37	19	8	3	1	1	233
Number of deaths ..	29	7	13	6	4	1	1	1	62
Percentage	21.0	26.1	35.1	31.5	50.0	33.3	100.0	100.0	26.6

take nourishment, (2) moist tongue, (3) bright and comfortable appearance, (4) loud cough with free expectoration of sputum, (5) temperature below 104°F., (6) pulse rate 110 to 120, (7) respiration rate below 40, (8) sufficient urination, (9) absence of nervous symptoms, and (10) good sleep. Unfavourable signs are (1) anxious and distressed appearance, (2) early cyanosis, (3) temperature above 104°F., (4) pulse rate above 120, (5) respiration rate above 40, (6) continued digestive disturbance specially tympanitis, (7) scanty urine, (8) low husky ineffective cough with scanty expectoration, (9) insomnia, (10) delirium, (11) lowering of temperature without reduction in pulse and respiration rate, and (12) typhoid stupor.

COMPLICATIONS

Complications were rare in this series. The few that were met with are noted below:—

Post-pneumonic œdema (mostly limited to lower extremities only)	27
Effusion (non-suppurative) ..	1
Arthritis (suppurative) ..	1
Do. (non-suppurative) ..	1
Otitis media ..	1
Parotid abscess ..	2
Corneal ulcer ..	1
Bacillary dysentery ..	2

Sequelæ.—All the cases of the series could not be followed as some of them left the garden later on. Among those who remained in the garden one case developed tuberculosis to which he succumbed.

Immunity.—In the present series 8 cases had recurrent attacks of pneumonia and 3 of them died in later attacks. This shows that immunity acquired in pneumonia is only temporary.

TREATMENT

It is not my object to describe the treatment of my cases in detail. The broad outlines of treatment are as follows:—

(1) After diagnosis has been established, minimal examinations are done.

(2) Antiphlogistine is applied hot in the first stage, only on the back and sides but not in front.

(3) A piece of warm flannel is loosely wrapped round the chest without causing hindrance to free respiration.

(4) When there is no draught, patients are kept in the hospital verandah, in complete rest in special pneumonia beds, under warm and light blankets.

(5) Strong purgatives are avoided. If the bowels are not properly moved, liquid paraffin is given at night. An enema is only rarely given as it is not much favoured by coolie patients.

(6) Sufficient fluid drinks are allowed. Bottles containing glucose solution in normal saline, as well as bottles of soda-water, are kept by the bed-side to enable the patient to drink as often as he likes.

(7) Milk, sago, tea and essence of chicken form the major items of diet.

(8) Digitalin, strychnine, adrenalin and camphor in oil are the cardiac stimulants usually used.

(9) For hacking cough codein phosphas is prescribed, especially at night.

(10) Good sleep is ensured. Chloral hydras and bromide, ortal and brandy are the remedies generally used as hypnotics. Morphine is rarely used and only with great caution.

(11) Oxygen inhalation is given when the respiration rate is 40 or upwards.

(12) Tepid sponging is done when the temperature is 104°F. or higher.

(13) Digestive disturbances and nervous manifestations are carefully watched and treated accordingly.

(14) The time-honoured potassium iodide and creosote mixture is given for the first 3 or 4 days, and, as soon as the sputum is loose, patients are placed on a simple stimulant mixture in lobar pneumonia cases and on stimulant expectorant mixture in broncho- and influenzal ones.

(15) During convalescence some preparation of cod-liver oil is given, usually Kepler's malt extract with cod-liver oil.

In this connection it is worth while to touch briefly on a few confusing points of treatment :

(1) *Local treatment*.—Local treatment is of value when judiciously administered. Nowadays use of antiphlogistine or any allied preparation has become a fashion. A private practitioner, who does not advise it, falls into disrepute. But unfortunately on many occasions it does more harm than good by impeding the free movement of the chest from its injudicious application. The chief indications for local treatment are pain and tightness in the chest. The value of antiphlogistine lies in its counter-irritant effect. Therefore, if it is to be applied, it should be applied in the first stage of the disease, only on the back and sides and never in front, as it impedes the movement of the chest and the heat of the application embarrasses the heart of an already febrile patient. The same result can be obtained by rubbing simple things like oil of turpentine or liniment ammonia and then lightly wrapping the part in a piece of warm flannel.

(2) *Alcohol*.—There is much divergence of opinion as to whether it should be used or not. Osler and McCrae (1921), Leslie (1924), Savill (1925) and Joules (1933) advocate it whereas Woodford (1933) deprecates its use except in alcoholics and the aged. My personal experience is that it is not necessary to give it as a routine measure, but it should be given when there is marked toxæmia, insomnia and delirium.

(3) *Morphine*.—It is found in textbooks that morphine is a valuable drug to relieve pain and induce sleep in pneumonia. I have learnt by bitter experience that great caution and judgment should be used as to when and to whom it should be given. It should never be administered in conditions of toxæmia and cyanosis, nor to children.

(4) *Quinine*.—Many physicians speak highly of the value of quinine in reducing pyrexia and helping the recovery. I, however, am not so impressed. But I think three intramuscular injections of quinine should be given if the blood shows malaria parasites. Thirteen cases in the present series showed scanty malaria parasites in peripheral blood, 6 being benign tertian and 7 malignant tertian infections. They were treated by quinine with good result. Authorities are almost unanimous that two acute diseases cannot run together. Finding of malaria parasites here means that pneumonia had developed in malarial subjects.

(5) *Cardiac stimulants*.—Here also opinions are divergent. Some authorities advocate its use from the very beginning while others reserve it for administration in later stages. I think, in young and healthy adults with little or no toxæmia it should be withheld till the symptoms of cardiac debility just manifest themselves, whereas in the aged, the debilitated and the highly toxæmic cases, it should be exhibited from the very beginning.

(6) *Oxygen therapy*.—Some authorities advise oxygen inhalation as soon as a diagnosis had been made, but the majority agree that it is indicated only when there is definite cyanosis or anoxæmia. When administered, it should be passed through warm water. McCurdy (1933) advises continuous administration of oxygen day and night by nasal catheter, the guiding principle being 'keep the finger nails pink'. He considers the administration by means of a funnel absolutely useless. In this hospital oxygen inhalation is given when the respiration rate is 40 or higher, but unfortunately by a funnel which is held over the patient's mouth and nose. In fact, I have hardly ever heard a patient bless me for this procedure.

(7) *S. U. P. 36 and iodine*.—Often we hear doctors claiming 'marvellous results' in pneumonia cases some with intramuscular injections of S. U. P. 36 and others with intravenous iodine. In 1932 I was asked by my former chief, Dr. D. P. Williams, to ascertain how far those claims were correct. Accordingly an experiment was taken up in which, in rotation, one was treated with iodine, a second with S. U. P. 36, the third one being treated on the usual lines as a control. No selection was made in the choice of patients of each group. Seventy-two cases were thus treated and the mortality rate is shown below :—

	Number of cases	Number of deaths	Percentage
Iodine ..	24	6	25.0
S. U. P. 36 ..	24	7	29.1
Controls ..	24	7	29.1

It is noticed that iodine therapy gave a little better result though not in any way 'marvellous'.

(8) *Steam inhalation*.—There are advocates of steam inhalation in broncho-pneumonia but much confusion exists as to when to use it. Personally I do not think there is much utility in this therapy but, if it is to be used, it should be used only in the early stage when there is scanty secretion but never when there is abundant secretion and cyanosis.

(9) *Serum and vaccine therapy*.—I have no personal experience of their use and value. But it is interesting to mention that Dr. Napier carried out research in the Jorhat district of Assam and found that pneumococcal types I and II were rare in that district, but isolated two other virulent local strains. He therefore concluded 'that the ordinary commercial serum which only acts in type I or type II will be of very little value in Assam, and that neither prophylactic vaccines nor sera will be of much use unless these two local strains are used in their preparation' (Napier and Dharmendra, 1935).

PNEUMONIA IN CHILDREN

The clinical picture of pneumonia in children diverges from that in adults in many respects. A quotation from Leslie is very impressive. He says 'as regards the clinical pictures, it is the atypical character of the symptoms and course of the disease which is the outstanding feature; and it is the aberrancy of type which adds so greatly to the difficulty of diagnosis, particularly in young children'.

The following are some characteristic features of children's pneumonia:—(1) High respiration rate, generally 50 to 80, (2) high pulse rate, generally 150 to 170, (3) no marked dullness, (4) diminished breath sounds or sometimes broncho-vesicular breathing, (5) absence of sputum which is usually swallowed, (6) remittent and relapsing character of pyrexia, (7) frequency of cerebral or gastro-intestinal symptoms, (8) greater tendency for complications, and (9) frequent absence of characteristic signs.

It must be noted that the child who appears irritable during illness generally progresses towards recovery and one who lies prostrated in bed usually declines towards a fatal end.

Principles of treatment are the same as in adults except that a child's position should be frequently changed in order to promote coughing and emptying of the bronchial tubes. Leslie advises occasional lifting of the infant out of bed and carrying it about in one's arms in order to bring on paroxysms of coughing which are apt to clear out the plugged bronchi. Emetics are useful in early stage when cough is feeble and there is accumulation of secretion. Opiates should not be used. Ammonium bromide with aromatic spirits of ammonia proves a valuable night sedative for a child. Hydrotherapy, specially a mustard bath, is of great service. Leslie recommends a combination of ammonium carbonate and ipecacuanha, but authorities are not unanimous on the use of expectorants.

SUMMARY

1. Two hundred and thirty-three cases of pneumonia in a tea garden of the Doom Dooma district have been reviewed.

2. Cases of influenzal pneumonia markedly outnumbered those of lobar and broncho-pneumonia.

3. Atypical clinical pictures were more common than the classical pictures of textbooks.

4. The largest number of cases were found between 10 to 50 years of age, but no age was exempt.

5. Males were found to be more affected than females; but the death rate was lower in the former. The gross mortality rate was 26.6 per cent.

6. The months of May and August showed the highest incidence, the reasons of which have been explained.

(Continued at foot of next column)

A CASE OF RHINO-MENINGORRHEA

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Discussion.—The central nervous system preserves its character as a hollow organ throughout life, beginning its development as a neural tube with a wide cavity throughout its length. The ventricle of the spinal cord does not seem to perform any important function.

The ventricular cavities in the normal adult brain form a continuous channel for flow of cerebro-spinal fluid throughout its length. If any part of this channel is occluded to prevent free circulation of its fluid, increased intra-cerebral pressure results in hydrocephalus or other serious pathological processes.

Dandy (1919) has actually produced experimental hydrocephalus by plugging the foramen of Monro in a dog.

Choroid plexuses are developed in the ventricles and most of the ventricular fluid is derived from the blood vessels of these plexuses by a process of filtration, osmosis and selective secretion.

The subdural space is scarcely more than a potential space. It contains a minimal amount of fluid. The subarachnoid space is traversed by connective tissue trabeculae. It contains a large amount of fluid and is independent of the subdural space.

(Continued from previous column)

7. No specific therapy was given. General outlines of treatment followed in this hospital have been described.

8. A few controversial and confusing points in treatment have been briefly dealt with.

9. The distinctive features of children's pneumonia have been briefly narrated.

10. The necessity of early admission of patients to hospital has been shown.

ACKNOWLEDGMENTS

I am indebted to my chief Dr. W. F. Whaley, M.D., for his kind permission to use the hospital statistics and for his valuable help in the preparation of this paper. My sincere thanks are also due to Mr. H. O. Swannell, the manager of the garden, for his unfailing co-operation and support in the management of the hospital.

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The subarachnoid space is widened in a few places to form cisterns where the arachnoid is widely separated from the pia. The most important of the cisterns is cisterna magna. The fourth ventricle communicates with this cistern through three openings in its roof—a median foramen of Magendie and two lateral foramina of Luschka.

The cerebro-spinal fluid is the water-bed in which the central nervous system is suspended. This fluid protects the brain from mechanical injuries. Nutrient media and waste products are probably dissolved in it.

The subarachnoid spaces are in free communication and cerebro-spinal fluid may pass through them from end to end of the nervous system. The amount of the fluid is variable, estimated as 80 to 100 c.cm. or even as much as 150 c.cm. It differs in chemical composition from all other fluids of the body. It is limpid, slightly viscous and has a low specific gravity 1004 to 1008. It contains only traces of proteins, small quantities of inorganic salt, and dextrose and a very few lymphocytes (10 in 1 c.mm.).

The cerebral fluid is constantly renewed. It circulates slowly through the brain ventricles and through the meshes of the subarachnoid spaces. If these spaces are opened to the outside by injury in man, a large amount of fluid steadily drains off—200 c.cm. or more in a day.

The sources of this fluid.—Primarily the blood vessels of the choroid plexuses, pia mater and brain substances give origin to this fluid. From the brain substances the flow is outward into the subarachnoid spaces and from the choroid plexuses it flows inward into the ventricles.

More recent experimental studies indicate that the plexuses are wholly secretory and not resorptive in function. Absorption of fluid from the ventricles into neighbouring veins has been shown experimentally to take place through the ventricular walls [Wislocki (Cowdry, 1928)]. The chief source of ventricular fluid is the choroid plexuses, as has been shown by embryological studies of Weed (1914) and his colleagues.

Pettit and Girard (1902) showed that the flow of cerebro-spinal fluid is increased by drugs that stimulate secretion (pilocarpine, muscarine, etc.), and choroidal cell changes indicative of the activity.

The chief channel of discharge of ventricular fluid normally is from the lateral ventricles of the cerebral hemisphere where the fluid is derived from the lateral choroid plexuses, through the foramen of Monro into the third ventricle.

Here the fluid is added from the choroid plexuses. From the fourth ventricle it passes into the cerebello-medullary cistern, and from here it diffuses in all directions through the subarachnoid spaces. The pathway by which cerebro-spinal fluid passes from the subarachnoid

spaces back into the blood stream is very difficult. Some of it gets into extracranial lymphatics by way of perineural spaces within the sheaths of the cranial nerve roots.

The perineural spaces in the optic nerve are in free communication with the subarachnoid spaces. The arachnoid membrane is imperforate around nerve roots and any fluid that passes outward into perineural spaces must pass through it by extravasation.

A very small part of the cerebro-spinal fluid enters lymphatics or veins but most of it passes directly into the big endocranial venous sinuses through the arachnoid villi. By numerous well-controlled experiments it has been shown that the arachnoid villi provide the main pathway for outflow of cerebro-spinal fluid directly into the venous circulation (*vide figure*).

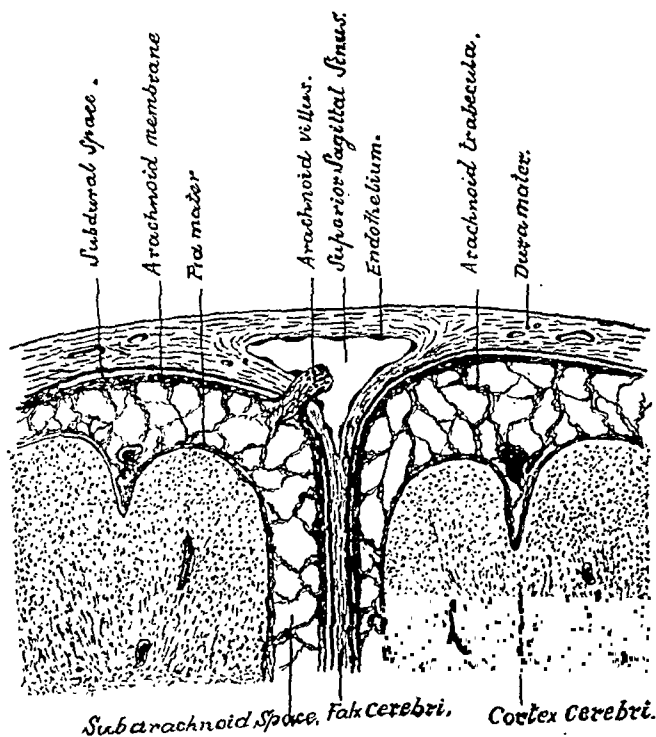


Diagram of coronal section of meninges and cerebral cortex to show relation of arachnoid villus to dural venous sinus. (After Weed.)

The case.—A male, aged 7 years 2 months.

History of previous illness.—At the age of (i) 2 months was attacked with pneumonia, at (ii) 7 months, again attacked with pneumonia and later on suffered from cough and fever occasionally, at (iii) 4 years 6 months, fever for 25 days treated as malaria, and at (iv) 5 years 2 months had a fall from a height of about 36 feet from a roof and remained unconscious for 5 days.

As a result of the fall he had the following manifestations:—(a) lacerated injury at the root of the nose, (b) bleeding from the right nares for about 2 weeks, (c) dribbling of watery discharge from the nares; since the bleeding stopped (the discharge is still persisting),

(d) a big swelling at the centre of the forehead which suppurated and eventually burst with discharge of pus (a scar mark is left), (e) an oblong swelling on the vertex, soft and compressible which disappeared with the bursting of the abscess on the forehead, and (f) swelling of the left eyelid which hung down to close the eye completely for about $1\frac{1}{2}$ months, and a dark red spot left on the eyeball when the swelling disappeared.

History of present illness.—(a) Irregular fever for two years. The fever often comes with chill and rigor, occasionally remains continuous for 7 or 10 days, and at times lasts for a day or so and comes down with sweating.

(b) Repeated dribbling of the watery discharge from the right nares which rarely dries up and reappears again.

He has been treated with quinine, atabrin, quino-hæmogen and other antipyretics with practically no effect, for the last two years.

X-rays.—No fracture or abnormality detected by the radiologist when the patient came for the examination of nasal discharge on 10th December, 1935.

Clinical findings.—The boy is fairly intelligent, takes interest in outside things, answers questions accurately, and does not delay in replying.

The upper surface of the lip is ulcerated and moist with fluid dribbling from the right nostril. About 12 c.cm. of discharge is collected in a test tube within 3 hours. The mucous membrane of the right nostril is thickened and ulcerated; left dry and healthy.

Laboratory findings.—(i) Examination of the nasal discharge (six samples were examined).

(a) *Naked-eye examination.*—Faintly turbid fluid with traces of mucus shreds floating in it.

Slight deposit at the bottom on standing.

It has not the yellowish-brown colour seen in old hæmorrhage into the subarachnoid space.

(b) *Chemical examination.*—Specific gravity—1004 to 1008; reaction—neutral; sugar content—variable percentage, in different samples, from 0.05 to 0.2 per cent or more; albumin content—variable in different samples, 0.01 to 0.05 per cent or so; globulin—no reaction; urea—10 mg. per 100 c.cm. or 0.01 per cent (only one sample tested).

(c) *Microscopical examination.*—Mucus shreds, nasal epithelial cells and a few lymphocytes are seen. No red corpuscles were detected.

Culture yielded pneumococci predominantly besides other mixed organism, e.g., *micrococci catarrhalis* and staphylococci.

The variability of the sugar contents in different samples remained unexplained. About 6 samples of fluid were examined on different occasions (estimation of sugar by Folin's method in a Klett colorimeter).

(ii) Glucose content in blood—0.08 per cent.

(iii) Examination of urine and blood—no abnormality detected.

Clinical diagnosis.—Coryza is a watery discharge associated with the watering of eyes. It is generally acute in onset, and the diagnosis of its cause is not difficult as a rule.

Common cold, lachrymation, iodism, bromism, arsenism and trigeminal neuralgia also cause excessive discharge from the nares.

Rhinorrhœa may be a result of neurosis.

The only other form of watery discharge from the nares is the escape of cerebro-spinal fluid, and the laboratory diagnosis showed the discharge to be such.

Conclusion.—There was a history of injury; the only possibility would be a fracture of the base of the skull involving the anterior fossa at the cribriform plate of the ethmoid with the rupture of the dura and arachnoid leading to the escape of cerebro-spinal fluid through this route. Extravasation of fluid through the perineural spaces in the optic nerve through the subarachnoid spaces is a less likely occurrence and the patient does not show any ocular disturbances.

The escape of fluid from one of the nostrils is a marked feature. The continuous flow of cerebro-spinal fluid for such a long time is interesting because dural defects are quickly repaired by formation of new dura.

It is difficult to explain the conditions under which the usual repair was not possible. Moreover, such a loss of fluid has not lessened the intracranial pressure, possibly the fluid lost has been replaced by increased secretion from the choroid.

The fluid discharge was continued for the last 2 years without any ill effects on the patient. No method is known to stop the cerebro-spinal fluid discharge. The advisability of stopping the flow of cerebro-spinal fluid is questioned as the choroid is secretory in function and will continue to secrete more and more, and serious pathological manifestations may be evolved by this procedure.

Occasional fever troubles him and it seems that it is due to local infection of pneumococci affecting the nasal cavities and the pharynx. Pneumococci are commensal in those regions and when they find a good nutrient medium in the constant presence of cerebro-spinal fluid discharge in the nasal cavities, they may occasionally become pathogenic and cause infection.

Extension of local infection into the meninges may lead to a fatal issue. It is, however, likely that nature has elaborated sufficient immunity against the infection to resist further extension into the meninges.

It is desirable that an autogenous vaccine should be tried to increase immunity against the local infection and it is expected that the fever may then be stopped.

The case is recorded on account of the comparative rarity of the condition.

(Continued at foot of opposite page)

MORE ON HILL MALARIA

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and

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It has recently (1935) been suggested by the senior writer that the spring epidemic of malaria in the lower Himalayan hills was spontaneous, and different from that at Calcutta where it was only due to relapses, because of the local differences in the physical conditions, of which the temperature was the most important factor.

Another possible explanation, however, not then taken into consideration, was that human infection in the hills was acquired during autumn just as in Calcutta but did not appear till spring, as has been reported to happen in Holland.

With this possibility in view anophelines infected in Calcutta during the recent autumnal infective season were transported by us to the lower Himalayan hills and the behaviour of the Plasmodia watched. *A. stephensi* was used as one now knows that its infective rate in Calcutta is at this season very considerable and would afford a good datum line for the observations in the hills.

The result of these have been that while the anopheline was becoming infected in Calcutta, when used as a strict control, at a rate of 58.5 per cent*, in the hills the rate was about 6 per cent. Further the evidence adduced below will show that under more 'natural' conditions than obtained during our observations autumn infection in the mosquito in the hills probably does not take place at all. The spring epidemic† of

*This rate would doubtless have been greater if two of our batches of mosquitoes had not been fed about 24 hours after a course of plasmochin which had not eradicated the gametocytes, but which doubtless affected their viability.

†Steps are now being taken to ascertain the spring rate of infection in the mosquito in the hills.

(Continued from previous page)

My thanks are due to Major R. Linton, I.M.S., Superintendent, Medical School, Dacca, for allowing me to publish this case note and also to Dr. P. Chakravarty, M.B., D.M.R.E., radiologist, for sending the case to me for investigation.

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malaria in the lower hills of the Himalayas is therefore not to be considered as a manifestation of autumn inoculation as it is in Holland, and is a *de tempore* phenomenon, the reverse of the state of affairs in that country.

The schedule below the report shows the detailed observations. In detail it will be seen that only 3 out of 49 mosquitoes taken to the hills, dissected and examined after 10 days had the glands infected with sporozoites and it is significant that these 3 were included in 2 batches (nos. 1 and 2 in the schedule, Table I) that had been kept, except for 2 days‡, after arrival, in a closed room on the south side of a laboratory on which the sun beat down and which was otherwise kept warm by a charcoal fire; the resultant temperature being as shown in Table II where it is contrasted with the temperature at which the other batches, which showed no gland infection at all, were kept, in a room open day and night.

As the required material was not available in the hills the mosquitoes had to be infected in Calcutta§, but this was an advantage in that infection was putatively established in the mosquitoes at the same rate as if they had remained in Calcutta and so one may conclude that it was afterwards that the infection was killed under the conditions of carrying on the observations.

It had been anticipated that if this event should take place, the degenerating parasite would be revealed by 'black spores' in the gut, but, in the sequel, whereas in Calcutta 32.5 per cent of the mosquitoes showed the developing plasmodia as zygotes or oöcysts in the gut wall, in the hills only 1 specimen, or say 2 per cent, showed black spores, so that the balance of the putative gut infection was entirely lost.

Then it was thought possible that the normal infection inseminated in Calcutta might under the conditions in the hills only be arrested and that, on restoring favourable conditions to the mosquito, the infection would forthwith manifest itself. With this in view, 28 of the mosquitoes were, after a greater or less interval, returned to Calcutta and then after another period of from 1 to 5 days examined for parasites. In one of these 28 mosquitoes infection of the glands was seen, while of 24 mosquitoes that remained in the hills all the time 2 developed infection. There was thus no proof that the infection had merely remained in abeyance in the hills.

‡On these 2 days the minimum temperature was 57°F. and the maximum 77°F.

§Some little time had to elapse before they arrived in the hills, the mosquitoes after being fed being usually either despatched the same night to the hills by post or taken by some guardian by train. Batch 1 was exceptional in remaining in Calcutta an extra 24 hours. The journey through the plains takes about 12 hours.

TABLE I
showing attempted infection in the hills of *A. stephensi* by *Plasmodia*

Date of feeding mosquitoes	Number fed	Species of <i>Plasmodium</i>	Dissection between	Number dissected	Gland infection		Gut infection				REMARKS		
					No.	%	showing living forms only		showing 'black' spores, only			showing living forms or 'black spores',	
							No.	%	No.	%		No.	%
1935 30-10 Batch 1.	5	M. T.	6 and 39 days.	5	2	40.0	0	0.0	0	0.0	0	0.0	1 showed infection 30th day, 1 on 39th day after having been taken back to Calcutta and kept here 2 to 3 days.
Control	9	..	20 and 39 days. 13 and 17 days.	3	2	67.0	3	33.3	0	0.0	3	33.3	
31-10 Batch 2.	9	M. T.	4 and 39 days.	9	1	11.0	0	0.0	1	11.0	1	11.0	3 returned to Calcutta for 4 to 5 days, none becoming infected.
Control	8	..	13 and 39 days. 13 and 16 days.	6	1	16.67	2	25.0	..	..	2	25.0	
10-11 Batch 3.	6	B. T.	25 and 27 days.	6	0	0.0	0	0.0	0	0.0	0	0.0	(After plasmochin course up to 9th.)
Control	5	..	13 and 16 days.	5	2	40.0	4	80.0	..	..	4	80.0	2 returned to Calcutta (1 to 2 days).
10-11 Batch 4.	8	M. T.	10 and 23 days.	8	0	0.0	1	12.5	0	0.0	1	12½	After plasmochin course.
Control	20	..	13 and 15 days.	20	10	50.0	6	33.3	..	..	6	33½	4 returned to Calcutta (2 to 3 days).
21-11 Batch 5.	4	B. T.	14 and 17 days.	4	0	0.0	0	0.0	0	0.0	0	0.0	2 returned to Calcutta (2 to 3 days).
Control	4	..	13 and 14 days.	4	3	75.0	1	25.0	..	..	1	25.0	
16-12 Batch 6.	20	Q. T.	24 and 27 days.	20	0	0.0	0	..	0	..	0	0.0	16 returned to Calcutta on 3rd January.
Control	20	..	19 and 33 days.	20	7	35.0	5	25.0	0	..	5	25.0	
Total including early dissections.	..	..	..	52	3	5.9	..	..	..	..	..	..
Total excluding early dissections.	..	..	..	47	3	6.1	..	..	..	..	2	3.9	
Controls	..	..	..	66	39	58.5	..	..	..	..	21	32.5	

It therefore appears justifiable to say that malarial infection is not possible at all under the conditions prevailing during autumn in the hills.

The development of the insect on the other hand goes on during the cold weather. Larvæ and pupæ were caught in the Balasun river bed; larvæ pupated when kept in the open at Ambootia (3,000 feet); and larvæ and pupæ were

the hills there is practically no autumnal malaria is that the physical conditions debar infection in the mosquito. People can therefore go without mosquito nets with impunity at this season.

Acknowledgments are due to Mr. O'Brien Webb, Manager of Ambootia Tea Estate, for so kindly giving us the hospitality of his administration, as well as privately, for the conduct of this enquiry. They are also due to

TABLE II

The temperature at which each batch of mosquitoes was kept

Batch	Conditions 1935 Nov.-Dec.	Rate of gland infection,* per cent	Time in Calcutta †	DAILY MAXIMUM		DAILY MINIMUM		DAILY MEAN		
				Range	Average	Range	Average	Range	Average	
1	1st to 11th south room closed. 11th to 13th opened. 13th to 14th closed.	33.3	30th and 31st October.	68 to 80	75.5	59 to 65	62.0	64	72.5	68.5
2	ditto	16.7	31st October	68 to 80	75.5	59 to 65	62.0	64	72.5	68.5
3	11th to 13th south room opened. 13th to 4th north room opened.	0.0	13th p.m.	60 to 65	63.0	..	54.6	54.5	62	59.0
4	11th to 13th south room opened. 13th to 4th north room opened.	0.0	13th p.m.	60 to 65	63.0	..	54.6	54.5	62	59.0
5	in open north room.	0.0		60 to 64	62.4	49 to 58	53.7	54.5	59.5	58.3
6	ditto	0.0		54 to 60	58.0	46 to 49	47.0	50	54.5	52.5

* after 10 days.

† does not include any time spent in Calcutta after being returned there. See also footnote \$, page 267.

found all along the Teesta valley and up the Kalimpong cart road to 5,000 feet. It is impossible however to say how the production compared with that at other seasons.

Then not only are the mosquitoes breeding out, but they bite at this season, as has been observed by us (Strickland, 1935).

It can be concluded then that the reason why at about the altitude of 2,500 to 4,000 feet in

the very efficient assistant medical officer of the estate, Dr. K. B. Chakraborty, who has also been of the greatest help, and to Mr. T. C. Biswas who was in charge of the laboratory arrangements which he carried through with energy and efficiency.

REFERENCE

Strickland, C. (1935). *Indian Med. Gaz.*, Vol. LXX, p. 559.

VELOCITY, SILT AND LARVAL DRIFT

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Introduction

THE scope of this paper is, as indicated in the title, to enquire into the factors which determine larval drift or infiltration, and to establish their mutual relations.

Since the advent of anti-larval methods of control, a considerable literature has sprung up on the causal factors of larval drift. Although these factors have now been ascertained, little has been done to place this knowledge on a scientific basis, or to follow the action of the various factors for a sufficiently long time to afford definite and conclusive evidence of their relative values.

The importance of velocity and silt as factors in the control of larval breeding places was clearly enunciated by Ramsay in a paper entitled, 'The factors which determine the varying degrees of malarial incidence in Assam tea estates, and the fundamental principles governing mosquito control of malaria in Assam'. Following on this, the writer of the present paper decided, some years ago, to carry out laboratory researches into the relation of velocity to silt and their respective influence on larval life. The results of these experiments were embodied in a paper on 'The control of malaria on a group of tea gardens in the Sibsagar division of Assam: some observations and results'.

This paper was read at the Annual Meeting of the British Medical Association in Shillong on 24th March, 1934.

These researches showed very convincingly that larval death rate was closely correlated to velocity, increasing with the velocity within limits. It was also established that silt did not influence larval death in these laboratory experiments and that pupation occurred at the normal time and adult mosquitoes were hatched out in silty waters.

At that time, Sir Malcolm Watson suggested to me that these laboratory experiments might well be corroborated by actual observations in local permanent waters. This was done and these field experiments have confirmed the laboratory findings and form the subject-matter of this paper.

The field experiments

These were carried out from April 1934 till 31st December, 1935, and are still being continued.

Method of investigation

Velocity.—Velocity of flow in rivers may be measured by several methods. The simplest is the use of a proper velocity meter, which is merely an adaptation of the old water-mill on a very small scale. The machine is geared to

correspond with known velocities and accurate results are easily obtainable.

Such a meter was not available at the time of these experiments and another method was used. A float made of wood, one inch square by one foot deep, was weighted on one end, so as to allow the wood to float with its top end about one inch above the level of the surface of the water. A tennis ball similarly weighted was also used at the beginning but was less successful. As shown in the charts appended, three different observations were made on three rivers widely separated.

In each case, a stretch of river was chosen as straight as possible and clear of any adjoining bays or backwaters along the banks. In every case, the length of the stretch of river chosen was 440 yards, the distance being carefully measured along the river bank.

The float was placed in the middle of the river at the upper end of the quarter-mile and the time of transit to the lower limit was checked by a watch.

It is necessary to repeat here that these stretches of water were straight as it is obvious that velocities would be reduced where rivers bend in their courses. It is also clear that, if velocities affect larval drift, larvæ are more likely to be absent in straight river courses than in sections where the course is tortuous and impeded. It can therefore be postulated that, if larvæ are found in the straight sections at any particular time, they are much more likely to be found in sections of rivers where the course is winding and the banks broken and irregular at the same time. The three charts shown therefore indicate conditions which are least favourable to the presence of anopheline larvæ, under any conditions of flow. Observations were made once a week during the years 1934 and 1935.

It must also be noted here that velocities vary with the distance from the bank and are usually highest in the middle and lowest at the banks.

A float deeper than 12 inches was found impracticable as the varying depths of these monsoon rivers render it impossible continually to alter the apparatus used.

Velocity varies at different depths in the same vertical plane and the velocity of the wooden float would be equal to the mean velocity of the river, when the depth of the float is from 0.950 to 0.927 of the depth of the river.

Such a degree of precision was not attainable in these experiments and the velocities registered must be regarded as slightly above the actual mean velocities in each case. This degree of error is merely of scientific interest and does not vitiate the result of the experiment.

In any case, the surface velocities only are of primary importance in considering the bionomics of anopheline larvæ, as much of their lives is spent on the surface.

Silt

When the velocities were checked, quart samples of river water were collected in wide-mouthed glass containers. The silt was separated by drying off the water and weighed, being calculated as grains per quart.

In addition to velocity, and silt, the charts appended show local rainfall, and the presence or absence of *Anopheles minimus*. As *A. minimus* is the principal vector of malaria in Assam, it has not been considered necessary to record observations on any other anopheline larvæ in these experiments.

Results of experiments

The results of these experiments are given below in tabular form, and show clearly, with the charts in the appendix, the relations between velocity, silt and larval drift.

In chart 3, rainfall is not recorded as exact figures were not available.

CHART 1

*River at Katonibari T. E.*Distribution of *A. minimus* larvæ

Year	<i>A. minimus</i> larvæ present	<i>A. minimus</i> larvæ absent
1934	April (when experiment began) till 7th May. 22nd August till 31st December.	8th May till 21st August.
1935	1st January, 1935 till 21st April, 1935. 15th August, 1935 till 31st December, 1935.	22nd April, 1935, till 14th August, 1935.

River velocities

Maximum velocity attained, 1934	5.0	miles per hour
" " " 1935	5.75	" " "
Minimum velocity attained, 1934	0.5	mile " "
" " " 1935	0.5	" " "

Velocity in relation to A. minimus larvæ

Maximum velocity with <i>A. minimus</i> larvæ present, 1934	2.125	miles per hour
Maximum velocity with <i>A. minimus</i> larvæ present, 1935	2.25	" " "

Silt in relation to A. minimus larvæ

	Year	SILT IN GRAINS PER QUART	
		<i>A. minimus</i> larvæ present	<i>A. minimus</i> larvæ absent
Maximum silt found	1934	24	34
" " "	1935	28	39
Minimum silt found	1934	5	11
" " "	1935	5	12

Average maximum velocity with *A. minimus* larvæ present = 2.1875 miles per hour.

CHART 2

*River at Hattichungee T. E.*Distribution of *A. minimus* larvæ

Year	<i>A. minimus</i> larvæ present	<i>A. minimus</i> larvæ absent
1934	15th November till 31st December.	31st May (when experiment began) till 14th November.
1935	1st January till 21st April, 1935. 15th October till 31st December.	22nd April till 14th October, 1935.

River velocities

Maximum velocity attained, 1934	3.875	miles per hour
" " " 1935	4.75	" " "
Minimum velocity attained, 1934	1.0625	" " "
" " " 1935	0.5	mile " "

Velocity in relation to A. minimus larvæ

Maximum velocity with <i>A. minimus</i> larvæ present, 1934	1.5	miles per hour
Maximum velocity with <i>A. minimus</i> larvæ present, 1935	1.375	" " "

Silt in relation to A. minimus larvæ

	Year	SILT IN GRAINS PER QUART	
		<i>A. minimus</i> larvæ present	<i>A. minimus</i> larvæ absent
Maximum silt found	1934	6	32
" " "	1935	6	24
Minimum silt found	1934	2	6
" " "	1935	1	1

Average maximum velocity with *A. minimus* larvæ present = 1.4375 miles per hour.

CHART 3

*River at Nagajanka T. E.*Distribution of *A. minimus* larvæ

Year	<i>A. minimus</i> larvæ present	<i>A. minimus</i> larvæ absent
1934	8th June (when experiment began) till 21st September. 1st November till 31st December.	22nd September till 31st October.
1935	1st January till 14th June. 8th September till 31st December.	15th June till 7th September.

River velocities

Maximum velocity attained, 1934	2.75	miles per hour
" " " 1935	3.75	" " "
Minimum velocity attained, 1934	0.25	mile " "
" " " 1935	0.25	" " "

Velocity in relation to A. minimus larvæ

Maximum velocity with 2.5 miles per hour
A. minimus present, 1934.
 Maximum velocity with 2.5 " " "
A. minimus present, 1935.

Silt in relation to A. minimus larvæ

	Year	SILT IN GRAINS PER QUART	
		<i>A. minimus</i> larvæ present	<i>A. minimus</i> larvæ absent
Maximum silt found	1934	14	15
	1935	20	32
Minimum silt found	1934	2	6
" " "	1935	2	10

Average maximum velocity with *A. minimus* larvæ present = 2.5 miles per hour.

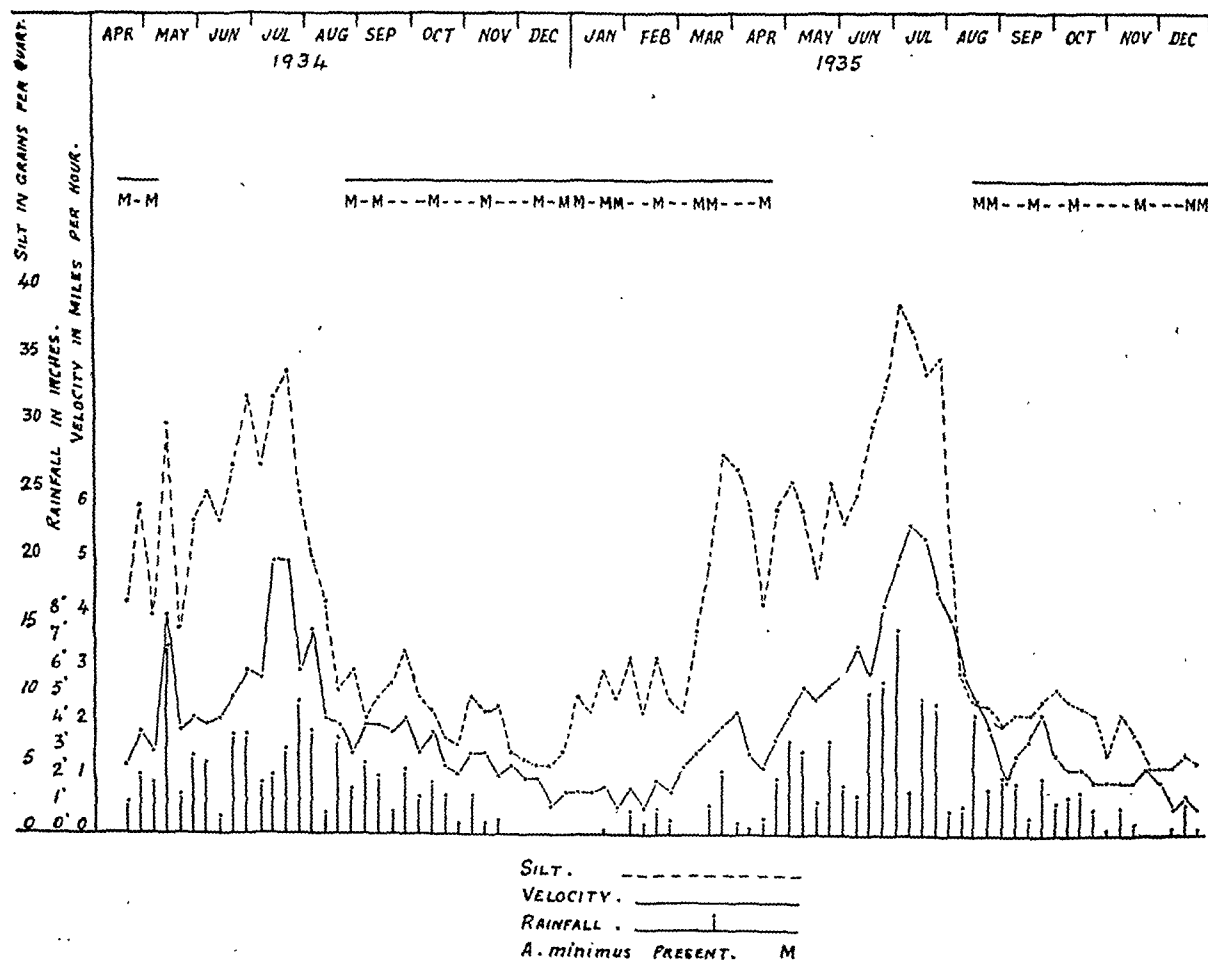
From these charts, it will be clearly seen that velocity and silt are closely correlated, silt

In my original paper, read before the British Medical Association at Shillong on 24th March, 1934, the following remark is made:—

'In normal years, the permanent streams and rivers are repeatedly flushed during the monsoon period and the rate of flow is fairly high. In the present year, owing to the deficient rainfall and its peculiar distribution, the normal flush and flow of permanent waters did not occur. The result was that *A. minimus*, which is normally not found in permanent water from the middle of June until late September, was present during the whole period of the monsoon.

During the year in question, 1933, the total rainfall was 72.98 inches only, against an average of 84 inches for this district of Assam. *A. minimus* larvæ were found throughout the monsoon in local permanent waters. From 13th July till 12th August the total rainfall was only 4.93 inches.

CHART 1
 Katonibari T. E.



increasing in fairly definite ratio to the increase in velocity. The effect of local rainfall, whilst also showing some degree of correlation, is not so close, as rainfall in the hills influences the velocity and silt, independently of local rainfall.

Again between 8th and 20th September, 1933, the rainfall was only 0.97 inch.

Malaria was very prevalent and, in one uncontrolled garden in the Sibsagar district, malarial admissions from 1st April till 30th

November numbered 1,857 out of a total admission of 3,034'.

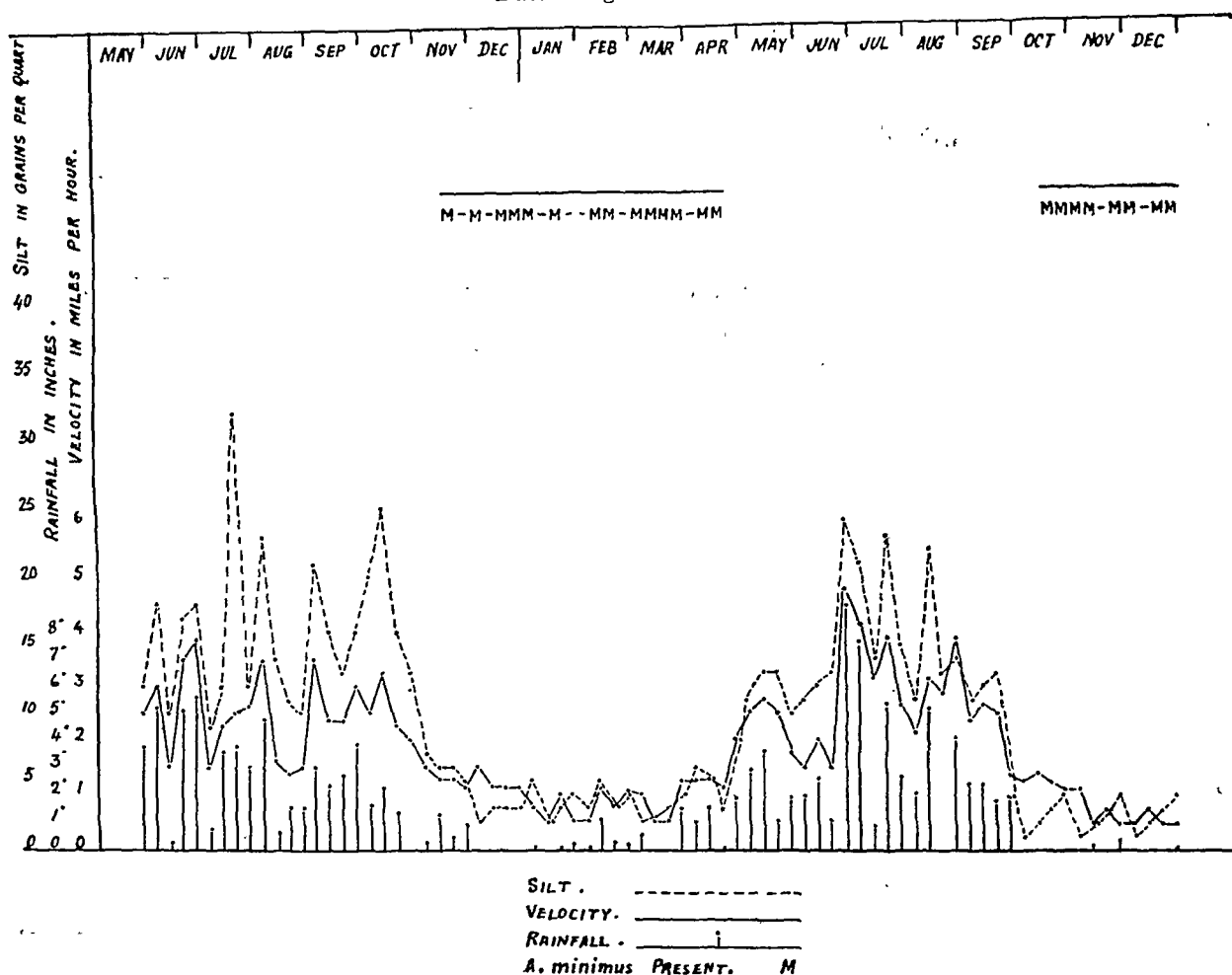
It is further remarked in the same paper:—
'Permanent waters, which are normally free from this species during the monsoon, become potent sources of *A. minimus* activity and constituted reservoirs of anopheline supply additional to the usual epidemic summer breeding resorts. It is very necessary to point out this factor in years of short rainfall in Assam, as so far the importance of permanent waters has not been definitely emphasized'.

It should also be noted that, during this period, the temperature range permits of rapid larval growth and rapid sporozoite formation in infected adult anophelines.

It must not be inferred that *A. minimus* larvæ were present daily during the whole of the periods shown, but they were found on many occasions within these limits, these occasions coinciding with the slack flow between successive spates.

For example at Katonibari, *A. minimus* larvæ were found in the third and fourth weeks of

CHART 2
Hattichungee T. E.



In elaborating any scheme for anti-larval control in Assam, permanent waters must therefore be taken into serious account as auxiliary breeding grounds in years of short rainfall.

This finding must now be amended and amplified in view of very conclusive evidence in the charts that, after the establishment of the monsoon in mid-June, *A. minimus* larvæ are present in permanent waters in the Sibsagar division in years of normal rainfall, at times varying from 8th June to 21st September in one instance and from 15th August in another, according to the rate of flow and the distribution of the rainfall.

August, third week of September, second week of October, third week of November and during December 1935. This larval drift was due to varying velocity of the river during that period, permitting larval ebb and flow.

These results are most important and indicate that larval drift in permanent rivers must be taken into close account in any scheme of anti-larval control. Not only so, but, as has been emphasized, if larvæ occur in these straight stretches of river, their presence in tortuous and ragged channels must be much more common.

The significance of these findings must be pointed out, as recently, Dr. Rice, Assam

Research Officer, has formulated a scheme which sponsors anti-larval control from early January to mid-June. This scheme has obviously been prepared without due knowledge of, and regard for, the basic factors, larval drift and adult migration.

He proposes to leave nature to do all the control from mid-June till the end of the year.

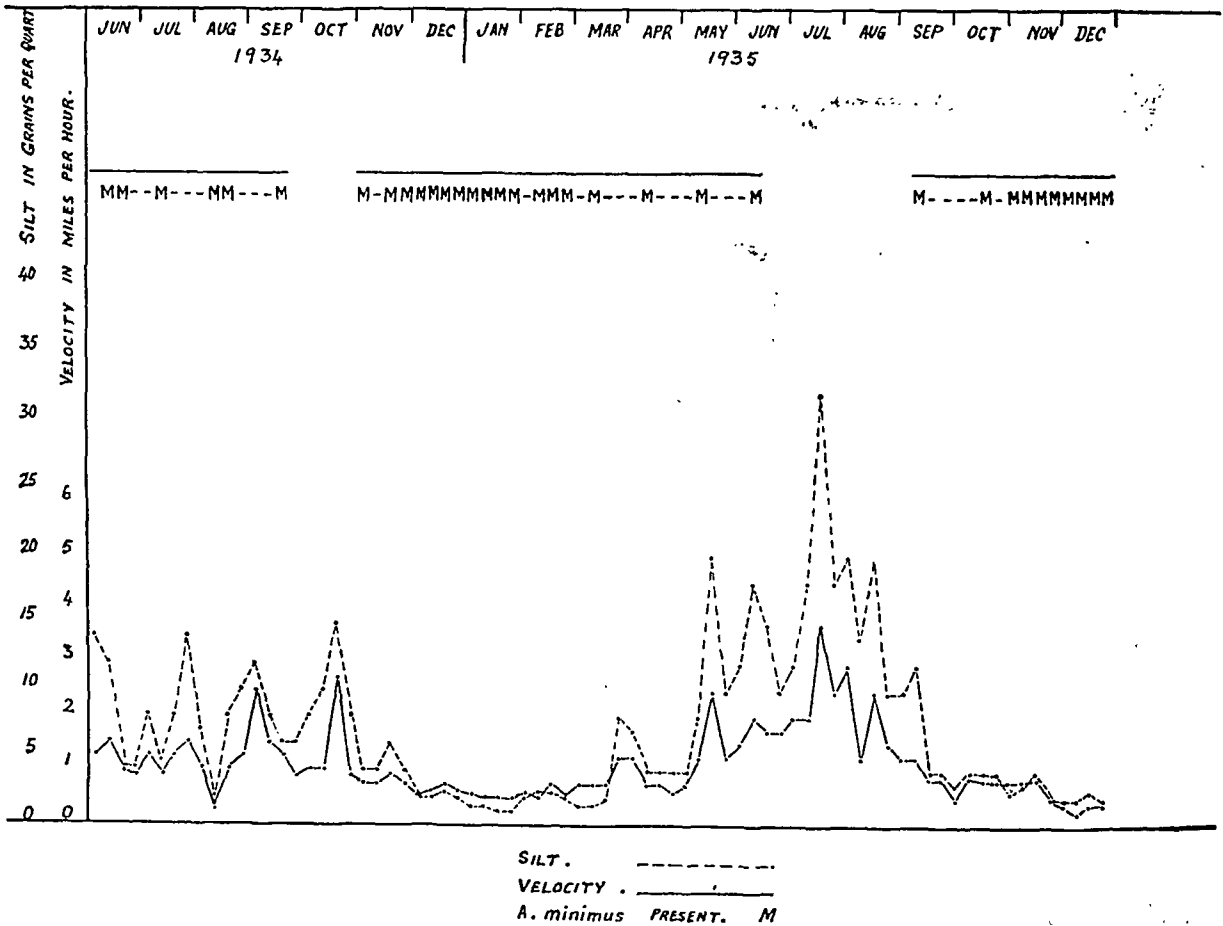
This plan completely ignores the inexhaustible colonies of larval 'unemployed' which line the banks of all permanent rivers for miles outside the relatively tiny zones of control. It forgets the adult anopheline population, hatched therefrom, which are 'on the dole' and are seeking

Adult migration and propagation would proceed during this time without let or hindrance. The result would be intensive anopheline breeding and prevalent malaria.

The danger of such a scheme of control cannot be estimated. It is heralded with the shibboleth of 'the most economical and efficient method of dealing with the malaria problem in Assam'. It remains but to point out that such a scheme can be neither economical, nor efficient; for it is intrinsically unsound as it ignores the basic biological facts of anopheline life. It must also be remembered that, not only the permanent waters as shown, but also many

CHART 3

Nagajanka T. E.



the means to sustain life and to reproduce their species. They must migrate to live. In seeking a blood meal, they are obeying the laws of racial preservation which are common to all, from the lowly *Amæba* to that end-product of nature called, sometimes perhaps optimistically, *Homo sapiens*.

Larvæ carried in by drift would hatch out unchecked and the adults that emerged would seek safer areas for egg deposition in the usual summer breeding resorts.

secondary breeding areas in temporary rain-filled jans, streams and tanks, are full of *A. minimus* larvæ during the months mid-June to November. As a matter of concurrent interest, it may be noted that the highest rate of sporozoite infection in *A. minimus* was found in this district in October, as noted in a paper by the writer. No pre-monsoon control would prevent this invasion.

Any scheme which ignores these factors is bound to fail and, in failing, would bring anti-

larval methods of malaria control into unmerited disrepute.

In this connection, Ramsay has noted that there are many tea estates, especially in Northern Bengal, where the watercourses become completely dried up during the cold weather and where no *A. minimus* can be found for several miles distant from the estates, which yet are invariably intensely malarious during the rains.

The reasons for this finding are now evident.

Can larval drift be nullified?

Sinton has suggested the continuous application of oil as by the use of oil-balls and the use of a floating boom placed across the stream. He found a considerable reduction of larval drift by these means. In his experiments, the rate of the current was stated to be 180 yards per hour and again 200 yards per hour.

These experiments are very instructive and indicate a possible means of control of larval drift in fairly sluggish streams. In Assam conditions, however, the river velocities are very much higher and it would be a matter of great difficulty to carry out similar work. The writer tried screening a small river above a controlled area with closely woven wire-mesh but this barrier was repeatedly washed away during heavy rains.

The present method of control is to oil *A. minimus* areas in permanent water in bamboo enclosures along the banks. This can easily be done and affords the only practical method of larval control in large rivers during the monsoon. It necessitates very close supervision and the constant attention of the anti-larval squad.

Silt

The silt tables show no definite relationship with the presence or absence of *A. minimus* larvæ, and the action of the silt, if a factor in larval bionomics, must be considered after further research. The findings so far corroborate the laboratory results already referred to. Silt is closely correlated to the variations in velocity. Possibly silt may act by causing scouring of the marginal vegetation which affords an anchorage for larvæ.

Summary

Experiments on the velocity of permanent waters, the amount of silt present and the relations of these factors to the larval stage of *A. minimus* are described. The times of larval drift are indicated and the velocities which accompany these larval infiltrations are registered. A note has been made on the effect of local and distant rainfall.

The effects of this larval drift on local anti-larval control measures are fully elaborated. Velocities which exceed the average of 2.04 miles

per hour, the limits being 2.25 miles per hour as highest and 1.375 as lowest, are inimical to larval life in Assam.

This average is approximately the same as those recorded by P. I. De Jesus in the Philippines. He recorded that *A. minimus*, although it prefers slow-moving streams, was also found in temporary rain-pools. He notes that no larvæ were found where the velocity increased to more than 3 feet per second during heavy rains. This corresponds to 2 miles per hour. He also makes an important note that in areas where *minimus* breeding streams dry out during the dry season, malaria is to be expected mostly during the rainy season. This bears out Ramsay's finding in North Bengal.

The use of Sinton's methods of controlling larval drift is commented on, in relation to the velocities recorded.

Charts are shown which indicate the relations between velocity, silt, and larval drift.

Larval drift during the monsoon months of June to October must be taken into account in all schemes of anti-larval control, which are practical.

The danger of non-control during the period of mid-June till mid-November is strongly emphasized.

The scheme of pre-monsoon control only is traversed and found wanting.

The correlation of silt to velocity is noted.

Attention is again drawn to the presence of secondary larval breeding resorts during the monsoon months.

The possibilities of controlling larval drift are discussed.

Acknowledgments

I have to thank the members of the medical staff and Dr. L. R. Dey of the Cinnamara Central Laboratory for their assistance in preparing the charts, and carrying out the routine work involved in these experiments.

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A Mirror of Hospital Practice

A CASE OF GAS GANGRENE

By H. W. FARRELL, F.R.C.S.E., D.P.H.
CAPTAIN, I.M.S.

A MALE child, aged 11 years, was admitted on the 2nd June, 1934, with the history of having fallen on his head from a tree 24 hours previously. The patient was unconscious with a temperature of 103°F. and pulse rate 120. He had a simple fracture of the left femur, simple fracture of the left radius and compound fracture of both bones of the right forearm with the proximal end of the right radius protruding through a small clean-cut wound about 3 inches above the wrist. Except for the coma, and a hematoma of the scalp, there was no other evidence of cranial injury. The compound fracture was reduced, the wound cleaned, the arm put up in extension and appropriate attention given to the other injuries. The next day the child was still unconscious with a temperature of 104°F. and the wound on the right forearm appeared clean and healthy both then and on the same evening. The following morning about 6 a.m. the fingers of the right arm were noticed to be discoloured and on opening the dressing it was found that the wound was oozing frothy serum while the surrounding tissues were greatly distended with gas bubbles, the temperature was still high, and the patient unconscious with pulse irregular and barely discernible.

By 9 a.m. the arm was distended with gas as far as the elbow and the skin was greenish-black in colour; there was a most offensive odour. The general condition was considered too bad to attempt operation and the father decided to carry the child home but having gone some miles on foot in the hot sun he changed his mind and carried the child back to the hospital about midday. The gangrene had by then spread to the shoulder with bubbles of gas all over the chest wall and the patient was pulseless and almost moribund.

Injection of anti-gas-gangrene serum was commenced immediately; it was given subcutaneously at the limits of the gangrene and also intravenously. From the time of commencement of the serum therapy, the gangrene did not appear to spread and the general condition improved enormously so that within 24 hours the patient was conscious and able to take drinks; during this time 240 c.cm. of serum had been given, about half of it intravenously and the remainder encircling the limits of the gangrenous limb. The following day (that is on the 5th day from admission) the general condition was considered sufficiently good to justify operation. Under general anaesthesia, the arm was disarticulated at the shoulder joint, the axilla and shoulder were enormously distended with gas, the muscles were greenish-black and friable and the gangrene was found to have spread in the muscle planes much beyond its skin limits; the gas escaped in large quantities and the odour was most offensive. No hæmorrhage whatever occurred during the disarticulation. The gangrenous muscles were then traced; it was necessary to remove the pectoral muscles completely up to their costal origins; the scapular muscles were not so extensively involved and it was possible to retain the scapula by partly denuding it of its muscles; the latissimus dorsi muscle was almost completely removed as well as the coracoid process with its attached muscles. The axillary vessels were tied underneath the clavicle but could not be identified satisfactorily and some gangrenous tissues were included in their ligature. The wound was left open.

The patient stood the operation well, progressed satisfactorily for some time and the wound began to granulate everywhere except where the axillary vessels had been tied; here there was a black slough and marked pulsation was visible; the nerve trunks had not been crushed and appeared to give great pain at the time of dressing the wound. On changing the dressing on the

21st June, the slough gave way and the axillary artery spurted great quantities of blood; fortunately it was possible to grip it digitally while the patient was anaesthetized and it was then tied higher up and the vein, which had begun to bleed during the manipulations, was tied separately with some difficulty as the vein wall was friable; the nerve trunks were then separated, pulled down and crushed.

The wound progressed satisfactorily and was rapidly covered with healthy granulations and the fever disappeared. A week later the temperature rose to 103°F. and some swelling was noticeable at the site of fracture of the femur which so far had not had efficient fixation and was as yet ununited. On the 29th June, under general anaesthesia, the thigh was opened up and an abscess containing thin pus and a large quantity of the same foul gas was found surrounding the fractured end of the femur; there was no gangrene of the surrounding thigh muscles; the abscess was drained and the offensive odour continued for some days. The subsequent progress was uneventful and the patient was taken away against our advice on the 25th July. Some months later it was learned that the wounds had healed and the femur had united but with considerable shortening.

The remarkable improvement following administrations of anti-gas-gangrene serum, and the subsequent formation of a metastatic abscess containing gas at the site of fracture of the femur without any appreciable gangrene of the surrounding muscles are interesting points in this case.

INTRAVENOUS ALCOHOL IN PNEUMONIA

By KRISHNAPRASAD DE, M.B.
Garhbeta, Midnapore

S. T., a postal peon, was attacked with right-sided pneumonia on 11th January, 1936, and was first seen by me on the 15th in the following condition:—

Pain in right chest, distressing cough with rusty tenacious sputum, slight cyanosis, offensive diarrhoea; temperature 103°F., pulse, 20, respiration 36. Lung—lower lobe consolidated, pleuritic rub, bronchial breathing and subcrepitant râles present.

Omnadin (Beyer) 2 c.cm. given hypodermically, and orally an alkali-glucose D drink and a mixture containing Sirolin syrup dimol and digifortis; biphlogiston on chest.

16th morning. Toxæmia supervened, cyanosis increased, pulse 130, respiration 45. Twenty cubic centimetres of a 20 per cent solution of alcohol in normal saline was given intravenously and lower bowel lavage potassium permanganate lotion (1-4,000). Six hours later the patient felt much relieved and had a good sleep.

17th morning. Pain and cough much less, sputum loose, cyanosis and toxæmia less, temperature—101°F., pulse—112 and respiration—32. Patient refused to take any further injection. Crisis occurred on the 18th evening and uneventful recovery took place.

Remarks.—Non-specific stimulation of the defensive powers by omnadin and a specific action of alcohol on the lung (see Baksh and Anderson, *I.M.G.*, December 1935) seemed to have exerted a very beneficial effect on the whole course of the disease. No reactionary rigors were present and temperature was found to be lower on the morning following the alcohol injection.

Indian Medical Gazette

MAY

THE POPULATION PROBLEM IN INDIA

THE population problem in India is a subject that has been discussed many times during the last decade in the editorial pages of this journal. It was not a very popular subject ten years ago. Much of what was written regarding the necessity for controlling the population in India was misinterpreted, and we found that we had raised the bitterest resentment in quarters whence we expected to get whole-hearted support. Vital statisticians took the view that our fears were unnecessary, sanitarians that our suggestions were retrograde, and religious sectarians that we were preaching heresy.

It is not hard to see why it is that any suggestion that the population should be controlled raises such angry opposition. There is a deep-rooted biological instinct, the instinct of self-preservation, that tells man that he should multiply his species until they become so many and so strong that they can banish or control all other animal species and rule the earth; though this has been achieved, the instinct still remains, but is interpreted differently, and it is for the sake of his own particular nation that he thinks it is necessary that he should reproduce his own kind in order that they may be numerically stronger than all others, and as a nation enforce their will upon all other nations; this has never been achieved and those nations who have come nearest to achieving this ideal—if it is an ideal—have not done it by force of numbers but by the development of certain qualities. This nationalized instinct is still unfortunately very prevalent and to-day one sees the paradox of dictators giving prizes for large families within countries and at the same time whining to other nations—or even attacking them—on the grounds of finding an outlet for their surplus population. But we in India have no extra-territorial ambitions, and there is not even this excuse for adopting a misguided policy.

Religious opposition is the easiest to understand and the most difficult to circumvent. Most religions were originally based on reason, but reason applied to conditions that existed a thousand or more years ago and do not exist to-day. Religions were always closely linked with national aspirations and it is natural that the founders should teach their followers to honour the prolific and condemn all means of limiting families. But what was reason a thousand years ago is dogma to-day. The world has moved on and religious teaching must come into line.

It is also easy to see how the opposition of the sanitarian originated. He has been taught to measure the success or otherwise of his work by the rise or fall of the population (or by the fall or rise in the death rate). A severe epidemic visits a province, villages and districts become depopulated, the population falls, and the result is disastrous to the revenues and general progress in the province; this is obviously a 'bad thing', and he argues inversely that an increase in the population must always be a 'good thing'. The subject would make excellent material for a fairy tale. A conscientious but not very intelligent sanitarian who had laboured all his life to increase the expectation of life in India was visited by a fairy god-mother who gave him three wishes. His first wish would not unnaturally be that the expectation of life in India—now 26 years—should be increased to that of England and Wales—about 57 years, and his second that he should live long enough to see the full effects of his first wish; but being of Scottish parentage he was cautious and traditionally reserved the third wish. Had he been wiser he would have used it and wished that the birth rate should be halved, but alas he left it until too late and when he realized the havoc he had wrought he was compelled to use his third wish in asking for a return to the *status quo*.

The ideals of the sanitarian are undergoing re-orientation; they are now rather the saving of human suffering and the avoidance of wastage of human lives than an actual increase in population. The difficulty is that the latter will follow as a natural sequence unless some measures are taken to equalize matters. First of all, however, he must devise new means of evaluating the success of his work; his measure must be the average of the state of health and nutrition in his population and not simply the rise and fall in its numbers.

From the medical point of view there is practically no opposition to population control or to the more particular birth control. The doctor has to attend too often on the poor woman worn out with numerous futile pregnancies, most of her children having died in infancy, or on the ill-nourished child born to parents who are unable to support even themselves on an adequate diet. He feels that people of all classes should have it within their power to control their pregnancies, and that this privilege should not be confined to the rich. This raises a point about which there is frequently much misunderstanding; it is often said that the birth control movement will only lead to control of births in the higher strata of the population and that future generations will be the offspring of the lower strata only, with an accompanying detrimental effect on the race. As pioneers such as Dr. Marie Stopes are always pointing out, the idea of the movement is to combat this very tendency. For many decades the upper

classes in England have used contraceptive measures, and the whole object of the movement is to show to the members of the lower classes how they can do the same in a cheap and effective manner when it is desirable, for medical or other reasons, to do so. Our readers will remember in our January number a paper which we reprinted from *Marriage Hygiene* on a contraceptive method suitable for Indian villagers.

There has been in India during the last ten years a very considerable change in the general attitude towards the population problem; views which we expressed 10 years ago and which were not well received are being repeated with slight variations and additions on all sides, and the dangers ahead are being viewed with alarm and not so frequently referred to as 'Malthusian nightmares'. The Public Health Commissioner with the Government of India in his report for 1933 has again pointed out the dangers of the situation, and although we have already reprinted a large section of his report in our January number we feel that we need not apologize for again quoting a very relevant extract from it :—

There seems little doubt that by 1941, when the next census is taken, the population of India will considerably exceed the estimate of 400 millions given in last year's report. The population problem in India is therefore a real one and, because scepticism still exists in the minds of certain authorities who continue to ignore facts, that problem demands further examination from an angle which, so far as I am aware, has not yet been given sufficient attention. The late Mr. Joseph Chamberlain, at one stage of his political career, spoke of 'three acres and a cow' as providing a sufficient standard of living for the average English agricultural labourer and this famous phrase has been frequently used since as forming a suitable basis on which to found arguments intended to defeat *laissez faire* opposition. Examination of the figures in India gives interesting results. The total land in British India amounts to 667 million acres but of this total only 232 million acres were cultivated and sown, 47 millions lying fallow, 154 millions being culturable but uncultivated, 145 millions being not available and 89 million acres consisting of forests. Even making the ridiculous assumption that the whole 667 million acres of land were available, this works out at only 2.44 acres per head of the population. A more reasonable assumption would be to take the acreage made up of cultivated and sown, fallow, and culturable but uncultivated. These three items total 481 million acres which gives only 1.75 acres per head of the population. But some land must be allowed to lie fallow, an additional proportion must be given over to the cultivation of crops other than food and, during 1933-34, the total acreage under food crops amounted to only 206½ million acres. This gives only 0.72 acre per head of the population in British India and it does not require more than an elementary knowledge of agriculture to realize that it is impossible to provide a sufficiency of food for the present population of India from an acreage of this dimension. It may even be held that were all available cultivable land given over to food production alone, the supply would fall short of reasonable and adequate demand. In order to forestall the usual argument, it can be admitted that the present shortage *might* be met for a short period of years by more intensive methods of cultivation, but that implies the immediate adoption of these intensive methods all over India and to those of us who know the village

ryot, it is difficult to envisage a solution of the problem along those lines. Even supposing that additional supplies were made available in this way, however, the difficulties would only be postponed for a few years, because the increased numbers of the population would rapidly absorb the surplus. Apparently, therefore, the problem of numbers in India is even more acute than before and it is one of such importance to the welfare of this country that it deserves immediate examination and certainly more detailed notice than it receives in paragraphs of this report. Numbers are so intimately bound up with economics that the problem is one which affects every department of Government and every class of citizen. It is a question which will shortly force itself upon the attention of every man and woman in this country: it is hoped that it will receive adequate notice before disaster befalls.

The problem is far from being one with which India alone is concerned and it is a matter that continually comes before the League of Nations' Health Organization. In a paper, by Doctors Burnet and Aykroyd, that appeared in the Quarterly Bulletin of the Health Organization on the relationship of food and public health, there were many references to this question of the adequacy of food supply and the population. They said that there were very clear indications 'that the amount of food at present produced is enormously less than the amount required to provide mankind with a satisfactory diet', and also that 'the existence of surplus stocks and overproduction in general at certain moments in certain countries does not in any way prove that the world produces too much food or even enough to meet the needs of the population'. They qualify this further by saying that 'in an era when great benefits might be derived from an unimpeded distribution of foodstuffs, nations are retiring into voluntary isolation and falling back on their own resources'. 'Transport is perfected within countries; paralysed between them'. They envisage a time, not far distant, when in progressive countries food supplies will be nationalized and all will be assured of an adequate basic diet, or even internationalized—a more distant dream. Before this can come about and whole nations are put on a food ration, they must first be put on a population quota which they must guarantee not to exceed. But this is an Utopian ideal which to-day seems more distant than it did even 20 years ago, and we must return to our own particular problem.

An important paper on this subject was contributed by Colonel Russell, the Public Health Commissioner with the Government of India, and Dr. Raja of the All-India Institute of Hygiene and Public Health; this paper appeared in the October number of the *Indian Journal of Medical Research*. They summarize the position very well, and by way of concluding our remarks on this important subject we feel that we cannot do better than quote them :—

'A human community has something of an organic unity in that its directive force, as represented by its Government, attempts to

shape the activities of the community towards what it conceives to be the common interest. The success or failure of such effort depends largely on the voluntary acceptance by the individual of the measures proposed by the State. The solution of the population problem must, therefore, rest with the people themselves. The problem is essentially one of man's increasing mastery, over his environment; the widest

measure of education is a consequent necessity in order that he may be suitably equipped to face his social and economic difficulties. In the words of Megaw, "What is needed is to educate the rising generation in the hard facts of existence, to show them how the people of other countries have solved their problems and then to let them choose for themselves how they will plan their lives".

Special Article

ASTHMA

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Definition.—The term 'asthma' derived from a Greek word meaning 'panting' is applied to a type of paroxysmal dyspnoea associated with prolonged expiration and wheezing respiration. This type of dyspnoea has to be differentiated from the dyspnoea of cardiac or renal disease, pulmonary new growth, foreign body in the bronchi and lungs, disease of the pleura, etc.

Asthma in India differs markedly from the disease as it is found in the West, and from the textbook description of asthma. It is only rarely that we come across cases of horse asthma, dog asthma, cat asthma, chicken-feather asthma, or pollen asthma.

Mechanism.—There are two main factors in the bringing on of an attack of dyspnoea—(a) bronchospasm and (b) bronchial obstruction caused by a swollen mucous membrane and the bronchial exudate. It is probable that both factors play a part in bringing about the stenosis; in some cases one factor is more marked and in others the other.

Theories.—There are many theories as to how this bronchospasm or bronchial obstruction is brought about. The theories can be grouped under three main headings—the nervous theory, the bronchial obstruction theory and the allergic theory.

(1) Nervous theory. According to this theory the attacks of asthma are considered to be due to bronchospasm caused by an irritable nervous system. This is the earliest theory and was conceived long before the constricting effect of the vagal stimulation on the bronchi was known. Later, when this contracting effect of the vagus stimulation on the bronchi was demonstrated, this theory became very popular. It was believed that asthma was essentially a nervous disease and that the attack depended on a spastic contraction of the bronchial muscles resulting from direct, reflex, or psychic stimulation of the vagus nerve.

In 1903 Brodie and Dixon demonstrated that stimulation of the septal mucosa of the nose

produced bronchial constriction. This finding directed much of the attention to the nose as the causative factor of asthma and at one time it was believed that all cases of asthma were dependent on a reflex set up by some pathological condition in the nose.

(2) There are various views as to how the turgescence of the bronchial mucosa and the secretion bring about the attacks. These views can be summarized as under :

(i) The attack is brought on by the air passage being plugged with viscid secretion resulting from an exudative bronchitis.

(ii) The obstruction is caused by turgescence of the mucous membrane brought on by vasomotor disturbances, this transient oedema of the bronchioles in asthma can be compared to vasomotor rhinitis and angioneurotic oedema in the skin.

(iii) Vascular dilatation and the resulting stiffness of the bronchial mucous membrane bring about a loss of elasticity and motility of the lungs; this interferes with its collapse and gives rise to prolonged expiration. According to this view there is a dilatation of the bronchioles and not a contraction.

(iv) Inflamed mucous membrane or the viscid exudate irritates the vagal nerve endings and reflexly produces a spasm. This theory embodies both the factors—the exudative bronchitis, which is the primary factor, and the resulting spasm brought out through nervous intervention.

(3) Allergic theory. Meltzer (1910) pointed out the similarity between the bronchial constriction in asthma and that seen in guinea-pigs dying of anaphylactic shock. He maintained that asthma was a manifestation of anaphylactic hypersensitiveness in human beings. Wolf-Eisner had already suggested anaphylaxis as the basis of hay fever. As all the facts about asthma and the asthmatics could not be explained by the nervous and the obstructive theories this anaphylactic theory of asthma came to be very popular. But before long it was realized that this manifestation in human beings differed a good deal from the anaphylactic phenomenon as seen in animals. For example, anaphylaxis is always acquired while

asthma is usually inherited; a protein antigen is required to produce anaphylaxis, while substances of any nature can give rise to asthma; and a sensitizing dose is essential in the production of anaphylaxis but not necessarily so in the case of asthma.

To cover this discrepancy a number of terms were coined:—allergy (altered reaction), atopy (strange disease), toxic idiopathies, protein sensitization, protein hyper-sensitiveness, hyper-ergy, idiosyncrasy, etc. Of these the term 'allergy' has become most popular.

According to this theory all cases of asthma are allergic in origin, conditions clinically resembling asthma but not conforming to the conception of allergy (heredity, high blood eosinophilia, sputum eosinophilia, early age of onset, protein sensitiveness, etc.) are grouped under the term 'asthmatic bronchitis' or 'asthmatoïd bronchitis'.

If this position, namely, that only those cases which are allergic in origin are to be labelled 'asthma', is accepted, then in India we have to deal mostly with cases of asthmatic bronchitis because allergic asthma amongst Indians is rare. We, however, take the view that asthma is a clinical syndrome and not a disease. The symptom-complex can be brought about by various factors and a better way is to include all cases presenting this symptom-complex under the term 'asthma' and to classify asthma into the allergic and the non-allergic type. According to this view the causation of asthma can be classified as under:

(A) Allergic.

(a) Allergens gain access to the body from outside.

(i) Ingested. Foods, such as milk, meat, potatoes, eggs, etc.

(ii) Inhaled. Pollens.

Animal emanations, *e.g.*, chicken feather, horse hair, cat hair, house dust.

Industrial dusts, *e.g.*, wheat dust, oil seed, wood dust, toilet powder (orris root), insect powder, moulds and fungi.

(iii) Injected. Animal sera, insect bites and stings.

(iv) Through skin contact. Chemical agents (occupational), physical agents, *e.g.*, heat, cold and light which lead to symptoms from liberation of some specific chemical substance in the body.

(b) Allergens produced in the body.

(i) Septic foci.

(ii) Toxins manufactured in the bowels.

The allergens by themselves may not produce any symptom, there are other important modifying or predisposing factors which have to be taken into account. Vaughan's idea (1928) of a balanced allergic state very well expresses the relationship between these non-specific, non-allergic predisposing factors, *e.g.*, toxic, psychic, environmental, and the specific allergens. When the individual is in a balanced state, an

exposure to the specific allergen may not cause any symptoms, but when the balance has been upset by any predisposing factor, exposure to the same allergen will give rise to symptoms.

(B) Non-allergic.

(1) Reflex, *e.g.*, from the nose.

(2) Chronic bronchitis, bronchiectasis, healed tuberculous foci.

(3) Psychic stimuli in an asthmatic individual may bring on the attack.

It must be added that the ultimate cause of asthma will be found in the particular biochemical make-up of the individual. The most important biochemical changes so far observed in asthmatics are defective liver function, hypoadrenia, and acid-base disequilibrium. A detailed reference to these points is outside the scope of this paper.

Diagnosis.—During the attack the diagnosis is easy. The patient sits up with a forward lean, the sternum is bulged out, the shoulders are raised, and the head is thrown back between the elevated shoulders. The mouth is usually kept open to facilitate breathing. The skin is pale, and may be slightly cyanotic in cases complicated with emphysema. Accessory respiratory muscles are straining to the utmost, specially the sterno-mastoids which stand out very prominently. With all this forced respiratory effort there is very little movement of the chest. Percussion gives a markedly hyper-resonant note and the area of cardiac dullness is decreased. Auscultation reveals the presence of noisy râles and rhonchi which drown the respiratory murmur; the expiration is prolonged and the inspiration is relatively short. During the attacks there may be only the history of the paroxysmal spasmodic attacks of dyspnoea or in long-standing cases there may be prolonged expiration and signs of emphysema.

Differential diagnosis

Cardiac asthma.—The dyspnoea is inspiratory in nature and is definitely associated with muscular effort. The patient bends forward and coughs up a bloody froth. There will be evidence of heart disease, *e.g.*, high blood pressure and arteriosclerosis. There may be a history of cardiac pain or angina pectoris.

Renal asthma.—This is often a pre-uræmic condition. There will be a hypertrophied heart, arteriosclerosis, high blood pressure and there may be retinal changes.

Diagnosis of the clinical type (allergic or non-allergic)

I. *History.*—A carefully taken history helps a good deal in coming to a diagnosis. The following points are carefully enquired into:—

(a) A history of inheritance. This is commonly found in the allergic cases and rarely in the non-allergic cases.

(b) The pre-asthmatic state. A history of having suffered previously from pneumonia,

chronic bronchitis, or pleurisy is very suggestive of the non-allergic type, while a history of a previous attack of urticaria or of dysentery is rather suggestive of the allergic type.

(c) Age of onset. The allergic cases usually start early in life, the non-allergic ones usually start late in life, say after 30 years of age.

(d) Seasonal incidence. Season of incidence throws some light on the possible causative factor. In this connection it is important to remember that the seasonal incidence tends to disappear after the disease has been present for some time.

(e) Association of the attack with a particular place. There is no such association in the non-allergic cases. In the allergic cases this association might give a clue to the offending substance.

(f) Association of the attacks with a particular food. In the non-allergic cases a hearty or indigestible meal might precipitate an attack, but there is no relationship with any particular food. In the allergic cases, at times the patient may be able to name the offending substance, for example, a patient may always get an attack after partaking of fish or egg.

(g) Association with pets, poultry, horses, cows, occupational dusts, etc., have to be noted. In this connection enquiry has to be made if the patient uses feather-stuffed pillows, if there are any factories, gardens, stables, etc., near his residence or place of work, and what occupation he follows. In the allergic cases some association between the attacks and some of these factors may be suspected or be evident. In the non-allergic cases no such association is to be noted.

(h) The condition of the patient's health between the attacks is important. The allergic patients, in the beginning at least, may give a history of clear-cut paroxysms with intervening periods of definite freedom from the disease.

II. *Examination of the blood.*—A total and a differential white cell count together with an Arneth count is done.

(a) A high eosinophile count with an Arneth index below 70 is usually seen in the allergic cases.

(b) A low eosinophile count with an Arneth index above 70 is usually found in the non-allergic cases.

III. *The therapeutic test.*—During the attack of asthma the effects of atropine and adrenalin are tried, beginning with atropine first. A subcutaneous injection of 1/150th grain of atropine sulphate is given at the onset of the attack. Atropine paralyses the vagal nerve endings in the bronchi, and if the attack is due to bronchoconstriction from vagal stimulation the injection will relieve the patient. On the other hand in the allergic cases where the attack is due to direct chemical stimulation of the bronchial muscles, it will have no effect on the attack.

In the allergic cases a subcutaneous injection of 0.3 to 0.5 c.cm. of adrenalin chloride (1 in 1,000 solution) at the onset of the attack cuts it short. Adrenalin will end the attacks in the non-allergic cases as well but atropine works better in these cases.

IV. *The pilocarpine response.*—During periods of freedom from the attacks response of the patient to a subcutaneous injection of gr. 1/20th of pilocarpine nitrate is studied. In the non-allergic cases this small dose of pilocarpine usually produces a marked response in the shape of increased salivation, increased perspiration, flushing of face, and feeling of warmth. In the allergic cases there is a slight or no response.

Confirmation of the diagnosis

(1) A radiological examination of the chest and an examination of the nasal passages may clear up the diagnosis. In the non-allergic cases the examination may reveal the presence of lung damage, nasal polypi, ethmoiditis, etc. In the allergic cases the skiagram of the chest is more or less normal (unless the disease is of very long standing) and the examination of the nose may reveal the presence of vasomotor rhinitis.

(2) The dermal tests might be of help in confirming the diagnosis in the allergic cases. These are based on the fact that those substances, which when inhaled, ingested, or taken into the body by other means, are capable of producing allergic response and will also produce an urticarial weal when brought into contact with the lower layers of the epidermis. There are various methods by which these tests are performed, the dermal, the intra-dermal, the patch test, and the Prausnitz-Kustner reaction.

The diagnostic extracts to be used for testing can be obtained ready-made in the form of pastes in collapsible tubes from Parke, Davis and Co. A rough, though handy, way of making the extract is to macerate a small amount of the substance in N/10 NaOH and to use the supernatant fluid for testing. The standard way to make an extract for diagnostic and therapeutic purposes is to wash the substance with ether, macerate or grind it if necessary, extract it with a buffered saline solution (Evan's solution), filter the extract through a candle and test it for sterility.

Interpretation of the tests.—A positive test is generally of great use, but does not necessarily indicate that a substance giving a positive test is the cause of the illness. Sensitivity to a certain substance may be present but may not be the cause of the symptoms. To incriminate any particular substance there should be some evidence that exposure to that substance actually brings on the symptoms.

On the other hand a negative skin reaction may be obtained in cases of definite clinical sensitiveness.

Utility of the dermal tests.—The tests yield useful information in the allergic cases where a specific allergen is responsible for the attacks, e.g., any particular food, animal emanations or dust.

They are no use in the allergic cases dependent on toxins, absorption from the gut or in the non-allergic cases.

TREATMENT

Treatment of the acute attack

(a) Drugs. There are three drugs commonly used to control the attacks—atropine, adrenalin and morphine-atropine. Atropine paralyses the vagal nerve endings and has a stimulating action on the respiratory centre. A subcutaneous injection of atropine sulphate gr. 1/100 to 1/150 given at the beginning of the attack cuts it short when it is due to bronchial spasm caused by vagal stimulation.

Adrenalin stimulates the sympathetic nervous system and dilates the bronchi. An injection of 0.3 to 0.5 c.cm. of a 1 in 1,000 solution adrenalin chloride given at the beginning controls the attacks. Adrenalin should be given in small doses and in the beginning of the attack. If neither atropine nor adrenalin relieves the patient an injection of morphine gr. 1/6 to 1/4 with atropine sulphate gr. 1/150 should be given. Morphine should be used only sparingly but should not be withheld when it is definitely called for. Only a small amount is to be used; big doses are unnecessary and harmful—unnecessary because morphine has no dilating effect on the bronchi and harmful because the cough reflex may be abolished and the patient may be drowned in his own sputum.

In status asthmaticus where the attack has continued for days together Hurst advocates continuous administration of adrenalin. After the initial injection of adrenalin, the needle of the syringe is constantly kept in place and one or more minims of adrenalin solution are injected every 15, 30 or 60 seconds, according to the reaction of the patient. This procedure can be continued for half an hour or longer. For severe cases Bray (1934) recommends a combination of adrenalin, morphine and atropine administrations. He takes two solutions, (1) adrenalin chloride solution 1/1,000 and (2) a solution containing morphine sulphate gr. 1/4, atropine sulphate gr. 1/100, and adrenalin chloride solution minims x. Of the solution (1), one minim is injected every half to one minute and of the solution (2), one minim is given every fifth minute till the spasm is relieved or till all the ten minims are exhausted.

Graeser and Rowe (1935) have used adrenalin inhalation to cut short the attack. A 1 in 100 solution of adrenalin chloride is used in a specially-made inhaler.

(b) Other drugs. Aspirin is of value specially in the cases where atropine injection affords relief. Caffein stimulates respiration and relieves fatigue. The ordinary A. P. C. powder (aspirin, phenacetin and caffein) works very well in aborting attacks which are not very severe. Ephedrin may be of some use in the mild attack, but its real value is in prophylaxis only. Asthma powders, cigarettes and sprays have no place in the treatment of acute attacks. In mild attacks they afford relief to some people but to others the fumes from the powders and cigarettes may irritate the bronchial mucosa.

The main constituent of powders and cigarettes is stramonium leaves to which saltpetre is added to aid combustion. Asthma sprays contain atropine, cocaine or adrenalin in different combinations.

Iodides are of value in liquefying the bronchial secretion and so making the cough more effective. A mixture containing iodides, tincture ephedra vulgaris minims x to xxx, and some anti-spasmodics (tincture lobelia æth. minims 10 to 20, tincture stramonium minims 10 to 20, tincture belladonna 5 minims, extract kuth liq. 10 to 30 minims, etc.) is given regularly. The following mixture works quite well:

R

Potassii iodidi	..	gr. 5
Sodii bicarbonatis	..	gr. 10
Tincturis stramonii	..	℥ xv
Tincturis lobeliæ ætheris	..	℥ xv
Tincturis ephedrae vulgaris	..	℥ xx
Spiritus chloroformi	..	℥ x
Aquam	..	ad oz. 1

One ounce every four hours.

General measures

(1) A purgative should be given at the beginning, calomel followed by saline does very well. Later, a daily dose of a laxative should be used to keep the bowels open.

(2) In cases where the attack is known to have followed a heavy or indigestible meal or some special food, an emetic should be given. In children the emesis may be produced by tickling the throat. Big doses of sodium bicarbonate, table salt or $\frac{1}{2}$ ounce doses of vinum ipecac. may be used to produce vomiting. Vomiting not only unloads the stomach but also loosens and brings out the bronchial secretions.

(3) For the first 24 to 48 hours the patient should be starved and, after that, easily-digestible foods should be commenced. During the first 24 to 48 hours when no food is allowed sufficient fluids and glucose should be given to the patient, in case he does not take enough fluids by mouth they should be administered per rectum (glucose-saline enema). In case of exhaustion stimulants, e.g., tea, coffee and brandy, should be given.

Treatment between the attacks

I. In the allergic cases where some specific cause is found.

(1) If possible the substance should be avoided. Foods that disagree may be eliminated and when the allergy is due to some occupational factor the occupation if possible should be changed. Pets can be removed and cotton can be used to stuff the pillows in place of chicken feathers, etc. It is very difficult to avoid dust, unless a dust-free chamber or a face-mask is used; residence in the hills above 4,000 feet high excludes most air-borne allergens.

(2) In cases where avoidance is impracticable, for example, where sensitization to multiple foods exists or where it is not possible to change the occupation, the treatment lies in trying to desensitize the patient against the allergen. In affecting desensitization two routes are available :

(i) Desensitization with gradually increasing doses of the extract of the substance given subcutaneously.

(ii) In the case of foods, oral administration of minute but gradually-increasing doses of the food in question, together with dilute hydrochloric acid.

(3) In addition to avoidance or desensitization any obvious endocrine defect or any infected or pathological condition of the respiratory or gastro-intestinal tracts should be treated.

II. In the allergic cases where no specific cause is found, and in non-allergic cases :—

(a) Treat any infection of the gut, e.g., *Entamoeba histolytica* infection, by emetine or carbarsone, hookworm infection by tetrachlorethylene, or by the preparation of an autovaccine to confer immunity against pathogenic organisms isolated from the stools.

An acid-pepsin mixture is of great help when there is evidence of hypochlorhydria. This is specially useful in children as cases of allergy of alimentary origin are most common at this age. The patient should be kept on a more or less vegetarian diet, meat and fish being cut down to a minimum.

The liver should be well looked after. An acid liver mixture after meals and a weekly dose of calomel followed by saline should be given. In order to improve the proteopexic function of the liver which depends on its glycogen reserve Oriel recommends 2 to 4 ounces of glucose to be taken daily in divided doses. Glucose may be taken with meals or dissolved in water and flavoured with orange or lemon juice, it can be taken morning and evening on an empty stomach. Like hydrochloric acid, glucose acts very well in children and both these medicines can be combined in one mixture.

(b) A thorough search should be made for any focus of infection in the teeth, tonsils, sinuses, bronchi, etc. Infective foci which can be removed should be dealt with surgically.

When the source of infection cannot be removed, an autovaccine prepared from organisms isolated from the focus should be used. Operative measures on the nose are not always successful, because the nasal condition may not be the cause of asthma, both the conditions may have a common causative factor or one condition may have no connection with the other.

(c) Drugs. A mixture containing iodides, antispasmodics (such as belladonna, stramonium, lobelia, kuth, etc.), arsenic (Fowler's solution), tincture ephedra vulgaris and sodium sulphate should be given regularly.

R

Potassii iodidi	..	grs. 5
Liquoris arsenicalis	..	℥ iii
Tincturis belladonnæ	..	℥ v
Tincturis lobeliæ ætheris	..	℥ x
Tincturis ephedrae vulgaris	℥	xv
Sodii sulphatis	..	grs. 60
Aquam	..	ad oz. 1

One ounce three times a day.

(i) Patients who suffer from nervousness or loss of sleep should get some sedatives, e.g., bromides, luminal, medinal.

(ii) Patients worried by irritating nocturnal cough should get a cough linctus at bed time. Linctus paregorici or a linctus containing one drachm each of syrupus virginii pruni and syrupus codeini phosphatus and fifteen minims of tincture of stramonium should be used.

(iii) When there is excessive expectoration creosote inhalation in a Burney-Yeo inhaler and a stimulant expectorant mixture should be given.

(d) Endocrine dysfunctions should be treated by adequate means. In case of thyroid deficiency, dried thyroid gland can be given by mouth; no other gland extract is active when given orally. Ephedrine hydrochloride may be given by mouth for adrenal insufficiency. Soamine injections are useful in toning up the endocrines.

(e) Non-specific protein therapy. The object of this form of treatment is to exhaust the sensitivity of the patient. Cecil (1935) thinks 'the most important function of the foreign protein reaction is the mobilization of immune bodies in the circulating blood'. Mackenzie and Frihbauer (1927) have shown that in rabbits, who were previously injected with horse serum but in whom the antibody to horse serum had disappeared, subsequent injections of chicken serum caused antibodies to horse serum to reappear. Peterson and others (1923) have shown that very small doses of peptone caused a lessened permeability of the endothelium. Hektoen (1935) believes that in the reaction to non-specific protein therapy important processes take place in the capillary walls and in the reticulo-endothelial system.

Protein therapy should not be used in presence of active or quiescent pulmonary tuberculosis, cardiac or renal diseases, during pregnancy, in cases of exhaustion and in chronic alcoholics.

There are a number of substances which have been used for the purpose of non-specific therapy :—

(i) Peptone. Auld (1918, 1920, 1925 and 1928) has introduced the use of peptone and serum peptone. Peptone is usually given intramuscularly in 7½ per cent solution; it may be given intravenously in 5 per cent solution. The intravenous administration is not considered safe by some. The initial dose is 0.3 c.cm., subsequent doses are gradually increased till a dose of 1.5 c.cm. is reached, and this dose is repeated about half a dozen times. Injections are given every third day to begin with, then the interval is gradually increased to seven days. In resistant cases Auld advises the use of serum peptone which is prepared by incubating the serum of the patient with agar and peptone.

(ii) Auto-hæmotherapy. Kahn and Emsheimer (1916) introduced the use of autogenous defibrinated blood for the treatment of asthma. Later, whole blood and serum have been successfully used for the same purpose. The initial dose is 2 c.cm., the dose is gradually increased to 10 c.cm. The interval is 2 days to begin with and it is gradually increased to 7 days with the increase in the amount of the blood injected.

(iii) Schiff introduced injections of whole or skimmed sterilized milk. The milk is sterilized in a rubber-capped bottle by boiling for one hour. Injections are given 3 times a week, starting with 0.5 c.cm. and increasing by 0.5 c.cm. each till a dose of 3 c.cm. is reached. Larger doses, 5 to 10 c.cm., have been recommended by others.

(iv) T. A. B. vaccine has been used intravenously. The initial dose is 15 to 25 million organisms of each; the dose is increased to 50, 75 and 100 million organisms, and then by 100 millions each time up to 500 millions. The injections are given twice weekly.

(v) Sulphur. One to two c.cm. of a 1 per cent suspension of sulphur in olive oil has been recommended by van Leeuwen (1932) for intramuscular injection. The injection gives rise to a local painful reaction and constitutional symptoms in the way of fever, malaise and headache. When the reaction has passed off a reduced dose may be given.

It is better to start with 0.5 c.cm. and gradually increase the amount according to the severity and duration of the reaction, the interval may be between 5 to 7 days.

(vi) Tuberculin. van Leeuwen and Varekamp (1921) introduced the treatment of asthma with tuberculin. The initial dose varies according to the reaction obtained with the von

Pirquet test. In very sensitive cases, the initial dose may be as small as 1/100,000,000 to 1/10,000,000 milligramme. In less sensitive cases the initial dose can be 1/1,000,000 milligramme. The dose is gradually and cautiously increased and the injections are continued for months or even years.

(vii) Gold salts have recently been used in the treatment of asthma. Banzsky (1935) attributes the benefits derived from these salts to their general tonic effects and specific tonic effects on the vegetative nervous systems.

(viii) Various other substances such as cobra venom, parasitic extracts, mixed coliform vaccine, influenza vaccine and turpentine have been used for the purpose of non-specific therapy.

(f) Breathing exercises. The patient is in the habit of using the upper part of his chest only for respiration and the purpose of the exercises is to teach him to use the lower part of the chest and the diaphragm. Livingstone and Gillespie (1935) report good results with breathing exercises. The patient is told to take a short inspiration through the nose and then make a long expiration through the mouth, with a whistling or hissing noise; this concentrates the attention on the expiratory phase. During expiration the epigastrium must sink in to ensure that the diaphragm rises in the chest. The exercises should be done for 10 to 15 minutes twice daily. It is reported that with their use the patient may even avoid an on-coming mild attack.

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Medical News

SECOND INTERNATIONAL CONGRESS FOR MICROBIOLOGY

LONDON, 25TH JULY—1ST AUGUST, 1936

THE Congress will be officially opened on Saturday evening, the 25th July, 1936. This will be followed by official receptions by His Majesty's Government, by the Royal Society and other societies. Excursions and visits to important institutes and laboratories have been arranged.

Already 20 workers belonging to the Medical, Veterinary and Biological sciences have signified their desire to take part in the Congress. Prospective members are requested to communicate, without delay, either with Dr. A. C. Ukil, Secretary, Indian Committee of the International Society for Microbiology, All-India Institute of Hygiene and Public Health, 21, Chittaranjan Avenue, Calcutta, or directly with Dr. R. St. John-Brookes, Honorary General Secretary, Second International Congress for Microbiology, Lister Institute, Chelsea Bridge Road, London, S.W.1, England, for a copy of the Registration Form and the Programme and to forward the membership fee of £1 sterling to Dr. J. T. Duncan, Treasurer, Second International Congress for Microbiology, London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1. Members should also intimate the Honorary General Secretary in London whether they would be accompanied by ladies.

The headquarters of the Congress will be located at the University College, Gower Street, London, W.C.1, where the scientific meetings will also be held. Messrs. Thos. Cook and Sons, Ltd., of Berkeley Street, London, W.1, the American Express Co., Inc., of 6, Haymarket, London, S.W.1, and Dean and Dawson Ltd., of 7, Blandford Square, London, N.W.1, have been appointed official Travel Agents of the Congress. Information as to special travel facilities, hotels in London, etc., may be obtained on application to these firms in London or at any one of their respective branches or agencies in Great Britain or abroad.

In accordance with the statutes of the Society communications may be made to the Congress in English, French or German. The Honorary General Secretary will be glad to hear from any prospective member who desires to take part in the general discussion on any of the prescribed subjects. All openers of discussions and subsequent contributors must forward to the Honorary General Secretary, Dr. R. St. John-Brookes, before 1st April, 1936, abstracts of their statements for incorporation in a special brochure available at the opening of the Congress. These abstracts are strictly limited to 600 words in case of openers and to 300 words in case of subsequent contributors. Openers will be limited to 20 minutes, invited contributors to 15 minutes and speakers in the general discussions to 10 minutes, at the President's discretion. It is hoped that interested workers of the Medical, Veterinary and Biological sciences will take advantage of this opportunity for making personal contacts between experts assembling from all over the world.

PROVISIONAL PROGRAMME

Sections

1. General Biology of Micro-organisms.
2. Viruses and Virus diseases in plants and animals.
3. Bacteria and fungi in relation to disease in man, animals and plants.
4. Economic Bacteriology. (Soil, Dairying and Industrial.)
5. Medical, Veterinary and Agricultural Zoology and Parasitology.
6. Serology and Immunochemistry.

7. Microbiological Chemistry.

8. Specific immunization in the control of human and animal diseases.

EXTRACT FROM PROCEEDINGS, COUNCIL OF STATE, 6TH MARCH, 1936

THE Honourable Khan Bahadur Dr. Sir Nasarvanji Choksy (Bombay: Nominated Non-Official): Sir, it is a matter of satisfaction that the gloom that pervaded the previous budgets has to some extent been dispelled by the two budgets which the Honourable the Finance Member has presented to us. Apart from that, Sir, my special thanks are due to him for implementing the proposals contained in the resolution which this House passed last session with regard to the Report of the Drugs Enquiry Committee. I am glad that the sum of Rs. 30,000 has been sanctioned to initiate the work in the Bio-Chemical Section of the Central Laboratory at Calcutta; as also in the Bombay Presidency where the Haffkine Institute is about to undertake a similar enquiry. This is just a beginning, but I do hope that as time goes on, more money will be found for these objects that will be for the ultimate good of the population. With regard to the grant of Rs. 10 lakhs to the Indian Research Fund Association for improvement in the conditions of village life and rural population, it has been laid down that the amount shall be mainly devoted to schemes connected with the prevention and treatment of malaria.

Previous speakers have already alluded to the subject and on more than one occasion I have brought it up before this House. All that I would say is that rural uplift—whatever funds may be spent upon it through Imperial or other channels—will be of no use unless the health of the population is conserved in the first instance and unless malaria-ridden tracts are freed from this scourge. Research will no doubt be directed to the prevention and cure of malaria; these researches will take considerable time, but we possess in the meanwhile a remedy for immediate use. I see no reason why it has not been fully availed of.

Sir, in a resolution that I moved in this House two years ago I referred to the use of the remedy that was cheaper than quinine, equally efficacious and the manufacture of which did not involve as much expense as quinine. We have known for a number of years that the cinchona plant from which quinine is prepared is very delicate and besides requires the optimum of conditions for its growth. I then pointed out that there were other species of cinchona that were hardy and capable of cultivation in ordinary climates. The alkaloids derived from those are being prepared at present on a small scale in Madras plantations. It has been named *totaquina* and consists of about 25 per cent of quinine combined with other alkaloids. Government once held large stocks of quinine; and over 60,000 lbs. have been given to the provinces for free distribution, in addition to their normal free distribution and more about 150,000 lbs. have been retained as a reserve. But, Sir, there exist vast areas in this country where the hardier species can be planted. I regret, however, to say that the matter has not been explored as it should have been ere long before. The time has arrived when the Imperial Council of Agricultural Research should be entrusted to take up the cinchona question. This body alone will be able to carry out further research if required and perhaps may be able to find something better than *totaquina*, in case this drug is not eventually found to be as efficacious as has been hitherto declared. I am at a loss to understand the policy which has dictated the cultivation of cinchona in India. May I invite the attention of the Honourable the Finance Member to the November 1935 issue of the *Indian Medical Gazette*, where the whole quinine policy has been fully discussed? It was shown therein that India has been lagging far behind other civilized countries in the production of a remedy that is of immense value to the masses. Look,

for instance, at Italy. It has vast plantations in her African colonies and within two or three years it will not only be self-sufficient but will be exporting quinine. And here with our vast resources of soil, climate, etc., we have to depend upon the mercy of a foreign confederation to supply us with by far the most vital necessity for ensuring good health. It is not that the manufacture and sale of quinine has been unremunerative! Then I should like to ask why we stand where we do in this regard?

Next, Sir, I come to the question of schemes for rural uplift. Numerous questions are involved in it and it is not by a little scheme here and a little scheme there that rural uplift can be made to achieve results. The first consideration is that India is beset with great difficulty owing to the fragmentation of holdings. Unless and until these holdings are consolidated there can be no improvement—not by legislative action—but by mutual and friendly adjustment and co-ordination among those concerned. Punjab has already demonstrated the feasibility of such consolidation. Another scheme of rural uplift which can well be copied is that associated with the name of Mr. Brayne. That has been adopted also in the Punjab and has done immense good. I therefore say, Sir, that the resources which have been placed at the disposal of the Provincial Governments should not be frittered away in small schemes here and there that are not likely to show results or prove attractive and useful. They should be directed to larger schemes in one or two districts that are likely to strike the imagination of the people with their utility and adaptability and serve as fruitful models. It is to be hoped that when the reports of last year's grant are received and new schemes are suggested, the Honourable the Finance Member by exercising his rights over the grant will see that those schemes are of practical benefit.

INTERNATIONAL UNION AGAINST TUBERCULOSIS

PRESS NOTICE

THE Xth Conference of the International Union against Tuberculosis will meet in Lisbon, from 7th to 10th September, 1936, under the chairmanship of Prof. Lopo de Carvalho, President-elect of the International Union. The discussion will be limited to three main subjects: Biological subject: *Radiological aspects of the pulmonary hilum and their interpretation*, opening report by Prof. Lopo de Carvalho (Portugal); Clinical subject: *Primary tuberculous infection in the adolescent and the adult*, opening report by Dr. Olaf Scheel (Norway); Social subject: *The open case of tuberculosis in relation to family and domestic associates*, opening report by Drs. Ch. J. Hatfield (United States) and D. A. Powell (Great Britain). Ten speakers, selected in advance from a list presented by the 44 countries belonging to the Union, have been designated to open the discussion on each of the questions on the agenda.

The Organization Committee of the Conference has prepared a very attractive programme of receptions and excursions; the latter will enable members of the Congress to visit the chief anti-tuberculosis institutions as well as the most picturesque scenery in various parts of Portugal.

Members of the International Union are invited to take part in the Conference free of any contribution fee. They may forward their application through the King George Thanksgiving (Anti-tuberculosis) Fund or directly to the Organizing Committee in Lisbon, at the following address:

Organizing Committee of the Xth Conference of the International Union against Tuberculosis
Assistencia Nacional aos Tuberculosos Avenida 24 de Julho, Lisbon (Portugal).

Persons who are not members of the Union and who wish to take part as 'Members of the Conference' must forward their application, together with a contribution

of 200 escudos (approximately 125 French francs), exclusively through the medium of—

King George Thanksgiving (Anti-tuberculosis) Fund, Talkatora Road, New Delhi.

HUNTERIAN SOCIETY. GOLD MEDAL FOR PRACTITIONERS

ANY registered general practitioner resident within the British Empire is eligible to compete and the medal, which is of gold, is awarded annually to the writer of the best essay on a subject selected by the Society.

Competitors—men or women—must be engaged in general practice and essays should be sent in by 31st December.

The essay must be unpublished and original, and be based on the candidate's own observation, but it may contain excerpts from the literature on the subject, provided that reference be made to the articles from which they are taken.

A copy of the rules and any further information can be obtained on application to the Honorary Secretary, Mr. Arthur Porritt, 27, Harley Street, W.1.

The subject selected for the essay is, for 1936 'Rheumatoid Arthritis—its diagnosis, treatment and end results'.

1937 'The Prognosis and Care of Heart Disease in General Practice'.

For last year's medal, essays were sent in from all parts of the Empire on the 'Conduct of Midwifery in General Practice'. The prize essay was written by Dr. Francis Bennett, M.D., Ch.B., New Zealand, Christchurch, New Zealand, who has been awarded the Gold Medal for 1935. This is the first time the medal has been awarded to a practitioner resident outside Great Britain.

THE FACULTY OF TROPICAL MEDICINE AND HYGIENE, BENGAL

THE following students are declared to have passed the D.T.M. Examination, session 1935-36.

Passed

(Arranged in alphabetical order)

1. Shyama Pada Banerjee, M.B. (Cal.), Medical Officer in charge, Burge Memorial Charitable Dispensary, Midnapore.
2. Phanibhusan Basu, M.B. (Cal.), D.P.H. (Cal.), Private Practitioner.
3. Jashvant Tripurashanker Bhatt, M.B., B.S. (Bom.), Private Practitioner.
4. Profulla Kumar Bose, L.M.P. (Burma), L.T.M. (Bengal), Private Practitioner.
5. Debi Pada Chakraverty, L.M.F., L.T.M. (Bengal), Medical Officer in charge, Singell Tea Estate Hospital, Kurseong.
6. Abdul Mumith Chaudhury, M.B. (Cal.), Civil Assistant Surgeon, Government of Assam.
7. Nihar Ranjon Chowdhuri, L.M. & S. (Rangoon), Private Practitioner.
8. Doraisamy Chelliah Daniel, L.C.P. & S. (Bom.), L.T.M. (Bengal), Sub-Assistant Surgeon, Burma Railway—Awarded the 'Chuni Lal Bose' Gold Medal, 1936.
9. Bibhuti Bhushan Das, M.B. (Cal.), Honorary Pathologist, Howrah General Hospital.
10. Madhusudan Das, M.B., B.S. (Patna), Private Practitioner.
11. Pruthwinath Das, M.B., B.S. (Patna), Private Practitioner.
12. Jyotirmoy Das Gupta, M.B. (Cal.), D.P.H. (Cal.), Bacteriologist, Calcutta Corporation.
13. Shivearn Singh Datta, M.B., B.S. (Punjab), Assistant Surgeon, Sibi, Baluchistan.
14. Saroj Bandhab Ghose, L.M.P. (Assam), Sub-Assistant Surgeon, Government of Bengal.

15. Ashutosh Ghosh, M.B. (Cal.), Private Practitioner.
16. Ban Behari Lal Gupta, M.B., B.S. (Lucknow), Private Practitioner.
17. Gursaransingh Hazuria, L.C.P. & S. (Bom.), Sub-Assistant Surgeon in charge, Laboratory Civil Hospital, Quetta, Baluchistan.
18. Muralidhor Kundu, L.M.P. (Burma), L.T.M. (Bengal), Private Practitioner.
19. Maharaj Narain Mathur, L.M.P. (C. P.), L.T.M. (Bengal), Pathologist, Victoria Hospital, Ajmer State.
20. Kulamani Misra, L.M.P. (B. and O.), Private Practitioner.
21. Nripathinath Mukerjee, M.B. (Cal.), Private Practitioner.
22. Valandai Deivasikamony Paramasivam, L.M.P., L.M. & S. (Hyderabad), Assistant Pathologist, Osmania Hospital, Hyderabad (Deccan).
23. Praja Mokkhavesa, M.B. (Chulalongkorn University, Siam), Private Practitioner.
24. Salahuddin Ahmad, M.B. (Cal.), Civil Assistant Surgeon, Government of Bihar and Orissa.
25. Sardar Ali, M.B., B.S. (Punjab), Medical Officer in charge, Shitagarh Dispensary, Dist. Multan.
26. Nirmal Chandra Sen, M.B. (Cal.), Private Practitioner.
27. Amalendu Sen Gupta, M.B. (Cal.), Private Practitioner.
28. Narayan Prasad Sinha, M.B., B.S. (Patna), Medical Officer in charge, Educational Hostels, Patna.
29. Shailendra Kumar Sinha, M.B., B.S. (Patna), Private Practitioner.
30. Kantilal Maneklal Shah, L.C.P. & S. (Bom.), L.T.M. (Bengal), Private Practitioner.
31. Nilkanth Balkrishna Tembhekar, L.M.P. (C. P.), Assistant Medical Officer, Barkui Hospital.

Current Topics

Results and Dangers in the Treatment of Amœbiasis. A Summary of Fifteen Years' Clinical Experience at the Mayo Clinic

By P. W. BROWN, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CV, 26th October, 1935, p. 1319)

THERE have been numerous reports praising or condemning various drugs, pessimistic and optimistic reports on the possibilities of curing the disease, presentations of results of administering drugs based on insufficient experimental or clinical data, and warnings, possibly unduly fearful, of the danger of using different drugs. An outstanding contribution to the chemotherapy of amœbiasis has come from the group headed by Leake, Reed and Anderson. It is from such critical studies that not only facts in regard to present drugs but also possibilities of developing new and better ones are obtained. Most workers in this field have long since agreed that emetine in safe amounts fails to cure more than half the cases of amœbiasis, and that even doses to the point of toxicity often fail. The organic arsenicals seem definitely established as more effective amœbiocides, although since arsenic is a well known poison there has been the search to obtain an effective but safe preparation. At present it would seem that there will always be some risk in the use of any effective arsenical because of occasional individual sensitivity. The dose may be safe in most cases, and experiments on animals indicate a wide margin of safety; but it must be remembered that arsenic or any other active drug is a potential poison. One should therefore always have respect for such preparations and use them cautiously.

The oxygenated quinolines have been the third chief type of drugs used in the treatment of amœbiasis. Some early reports on chiniofon, introduced as yatren, were most enthusiastic, and in the twelve years in which it has been used its worth has been established. More recently, the administration of vioform has been suggested, as experimentally it was found to be very effective. Too short a time has elapsed, however, to establish its final rating. An even more recent drug for the treatment of amœbiasis is diiodohydroxyquinoline, regarding which only a few scattered but encouraging reports are available.

For this period of fifteen years, data on the treatment of amœbiasis in 834 cases are obtainable. In 523 of these cases, information as to results of treatment was secured later. This group of 834 cases comprises a large part of the cases in which a diagnosis of amœbiasis has been made in this period. To facilitate

analysis of so large a group, the first section of this paper will deal with some of the more commonly used drugs in this fifteen-year period, with particular emphasis on reactions; the second section will relate results of treatment.

SECTION I: COMMONLY USED DRUGS AND THEIR REACTIONS

Since ipecac, with its later derivatives emetine hydrochloride, bismuth emetine iodide, auremetine, and the short-lived preparations alcresta, adsorbed emetine and propylcephaline, is the oldest specific drug used in treating amœbiasis, it is naturally the one about which much has been written. Ipecac has dropped out of the armamentarium largely because of the great difficulties encountered in maintaining adequate dosage. Of thirty-six patients at the clinic who received ipecac, 50 per cent suffered severe nausea and vomiting so that hospitalization always was necessary (table I). Even as late as 1927 and 1928, two patients who were resistant to other forms of treatment received ipecac. It seems ironical that ipecac at present is remembered only for its pioneer rôle in the treatment of amœbiasis.

Bismuth emetine iodide continues to be in some favour, especially in England. It too, however, has the disadvantage of frequently causing nausea and vomiting. In the first seven years of the fifteen, thirty-five patients with amœbiasis were given it (table I); its use was then discontinued, however, in favour of emetine, provided any form of emetine was indicated. Bismuth emetine iodide has the advantage that it can be administered orally, which makes its use advisable in some cases.

Emetine hydrochloride has seemed to be a standby through this entire fifteen-year period. With the advent of treparsol and acetarsone (stovarsol), however, its use decreased somewhat, but it resumed an active rôle in the treatment of amœbiasis in conjunction with treparsol. Ever since Sir Leonard Rogers' vivid report (1912) of his first three cases in which emetine hydrochloride was administered, no worker in this field has failed to marvel time and again at one of the therapeutic miracles in medicine: the prompt response of active and acute amœbiasis to 0.19 gm. or 0.26 gm. (from 3 to 4 grains) of this drug. At the clinic, emetine hydrochloride has always been administered subcutaneously, and it is well to note that much undue local reaction is avoided by observing care in injecting it subcutaneously; it is not injected intramuscularly or intradermally, and we see no need of intravenous administration.

Naturally, with the widespread use of emetine there soon appeared discouraging reports about its failure to

TABLE I
Reactions to drugs

	Number treated	Nausea and vomiting	Neuritis or palsy	Toxic erythema	Diarrhœa	Urticaria	Severe local reaction	Theoretical reactions; present dosage; per cent
Ipecac ..	36	18*	..	..	..	..	..	..
Bismuth emetine iodide.	35	2	..	..	2	..	..	..
Emetine hydrochloride.	554	..	16†	..	1	4	2	0.54
Arsphenamine ..	38	..	..	..	..	..	..	..
Treparsol ..	301	..	..	8‡	..	..	..	2.6
Acetarsonne ..	232	..	2	13§	..	..	..	..
Chiniofon ..	37	..	..	..	18*	..	..	..
Vioform ..	18	..	..	..	..	..	..	..
Carbarsone ..	8	..	..	1	..	..	..	..

* 50 per cent.

† 2.8 per cent.

‡ 2.6 per cent.

§ 5.6 per cent.

effect a cure in more than half of the cases. Occasional reports also appeared of neuritis or palsy, myocardial injury, profound local reactions at the site of injection and, finally, deaths associated with its use. I have been able to find reports of ten deaths attributed to emetine in the period from 1912 to 1935. The United States Bureau of Vital Statistics has no records of death due to emetine poisoning in the United States, although there are two or more reported in the literature. An article by Chopra and Ghosh in 1922 quoted Hall and Dalimer as each reporting three fatal cases. Unfortunately the references were omitted, and I can find only Dalimer's article in 1917, quoting in turn two cases of emetine neuritis or palsy. By no means is there any intention to minimize these tragedies, yet with the millions of injections this small number of untoward reactions is extraordinary. In these ten fatal cases the dose received ranged from one dose of 0.02 gm., given to a child aged 2 years, who died very suddenly after the injection, to 2.64 gm. administered in the course of eight weeks. Leibly's case (1.28 gm. in eight weeks, equivalent to 34 mg. per kilogram) and Levy and Rowntree's case (1.74 gm. in eighteen days, equivalent to 25 mg. per kilogram) are the only two cases in which I find data as to the dose per kilogram of body weight. The other seven patients received 1.07, 1.44, 1.04, 1.52, 1.08, 1.88 and 0.48 gm. in periods of from two to eight weeks.

In the series at the clinic of 554 patients who received emetine (table I) the usual dose ranged from 0.24 to 1.17 gm., the latter dose being given in a month's time and being not more than 17 mg. per kilogram. In the past seven years the usual dose has been from 0.39 to 0.65 gm. in any one month, or about 9 mg. per kilogram (estimating an average normal of 70 kg.). There have been no deaths in these 554 cases except of one patient who was moribund on admission as a result of peritonitis from a ruptured abscess of the liver; death occurred seventy-two hours later. He had received 0.39 gm. of emetine in that time.

The not tragic but nevertheless distressing complications of emetine therapy are peripheral neuritis or palsy and cardiovascular disturbances. It is well to remember that the effect of emetine is cumulative and that it is eliminated slowly just as is the arsenic in acetarsonne and carbarsone. In 1920 Mattei demonstrated this fact and in one case found emetine present in the urine sixty days after an eight-day course of 0.48 gm. of the drug. No doubt not all deaths have been reported, and certainly many of these less serious reactions have not. I have found thirty-seven such cases in the literature in which the average amount of emetine given was 1.0 gm., eight of the patients having been poisoned by 0.65 gm. or less. This

gives no idea of the incidence of injury to nerves or myocardium. Only two cases, with accompanying electrocardiograms, have been reported in which it was felt that there was cardiac injury; in one the vagal influence had not been ruled out by atropine and in the other the patient had received digitalis prior to the taking of the electrocardiogram; the tracing was normal three weeks later. There is no question that intoxication is manifested by rapid pulse, asthenia, vomiting and diarrhœa and that it often goes on to frank neuritis or palsy. As to how much actual myocardial injury is produced in patients who survive is still debatable. It has been suggested that tachycardia is due more to irritation of the vagus nerves than to the myocardial injury. The experiments on animals leave no doubt that emetine is a protoplasmic poison, while the nerve lesions are the result of degeneration of fibres in the motor roots and not actual neuritis. Clinically, emetine should be used at a point far below toxicity, leaving only a very small chance of reaction in the exceedingly hypersensitive individual. In many of the reported cases of intoxication and in our own there have often been warnings of intolerance which in retrospect are quite definite. In some cases the reaction appeared without any warning.

The probability of myocardial injury increases at the age of 60 years and beyond, so that one might expect to note some evidence of cardiac disturbance on giving emetine to older patients. There are data on twenty-five patients whose ages extend from 60 to 74 years, all of whom received from 0.26 gm. (4 grains) to 1.1 gm. (17 grains) in from two to four weeks' time (an average of 0.65 gm., or 10 grains). In two cases neuritis developed; in one the symptoms came on after 1.1 gm. (17 grains) of emetine had been given, and the patient suddenly recalled having recently received emetine elsewhere. Throughout the first three weeks during which neuritis was most marked, this patient's blood pressure held constantly at 175 to 180 mm. of mercury systolic and 90 to 94 mm. diastolic, with a pulse rate at 80 beats a minute. The second patient was not seen at the clinic after neuritis appeared, as it had followed a second course of 0.26 gm. (4 grains) of emetine administered by his local physician. Report was made only of weakness of the extremities. The remaining twenty-three patients showed no intolerance to the drug.

In the 554 cases at the clinic in which emetine was given (table I), there were eight in which there was generalized asthenia and weakness of the extremities to an extent that would justify classifying it as a neuritis or palsy. In eight other cases, exhaustion and general depletion were definite and possibly should likewise be considered as a mild palsy. The first eight patients

received emetine in doses of 1.1, 1.04, 0.65, 0.52, 0.91, 0.97, 0.65 and 0.78 gm. Six of the second eight patients received 0.78 gm., one received 0.75 gm., and one received 2.73 gm. In no case was there any particular reference to disturbance of the cardiovascular system. In six of these sixteen cases there were early warnings after the first course of from 0.24 to 0.39 gm. had been given, such as hives, increased diarrhoea, joint pain and weakness, but the administration of emetine was continued. In ten cases the symptoms appeared shortly after completion of the course of emetine. One must accept the entire sixteen, or 2.8 per cent of the 554 cases, as the incidence of emetine reaction; with our present average dose of 0.65 gm., however, it is noted that only three of the sixteen reactions occurred at this dose or less. Merely for contrast, as well as to emphasize the all important factor of individual tolerance, I have the record of three patients who received 8.3 gm. (125 grains), 8.7 gm. (134 grains) and 11.6 gm. (180 grains), respectively in a period of from eight to twelve months; in addition, many others have received two or three times the usual 0.78 gm. in three months' time. In none of these cases were there signs of intoxication. In two additional cases urticaria was prominent, and in still two others large ecchymotic areas, with induration, developed at the sites of injection. The last two might have been due to errors in technic or perhaps to a faulty product.

From these observations in 554 cases it hardly seems justifiable to discard emetine, although it should be re-emphasized that emetine in the total dose of 0.65 gm. in two weeks is employed only to control acute manifestations of the disease and to give the patient prompt relief but not with the idea of continuing with the drug to bring about a cure. With this in mind, exception will not be taken to my stating that three reactions to 0.65 gm. or less in 554 cases (0.54 per cent) is about the incidence of reaction or idiosyncrasy to emetine.

Organic arsenicals.—Arsphenamine, acetarsone and treparsol have been the arsenicals used at the clinic (table I). In the last two years we have had occasion to employ carbarsone, but in too few instances to justify any conclusions. From the studies of Reed, Anderson, David and Leake, carbarsone is shown to produce fewer reactions than either treparsol or acetarsone, although I have had reported to me two cases of toxic erythema and one case of neuritis. The slow elimination of carbarsone, as with acetarsone, suggested the possibility of an occasional neuritis. Arsphenamine has been put aside not so much from fear of it but rather because the expense and time element favoured orally administered drugs. Thirty-eight patients received arsphenamine, and with no untoward reactions.

Acetarsone was thoroughly tried and seemed to be the answer to the problem of an easy, inexpensive drug that would complement emetine, emetine being used for control of acute symptoms and acetarsone for eradication of the amebas. Deaths are recorded in several reports, but in the 232 cases in this study (and in many others in which acetarsone was prescribed) a death has not occurred. Toxic erythema has been noted, however, occasionally being severe enough to be considered as dermatitis exfoliativa; toxic erythema was encountered in thirteen (5.6 per cent) of the 232 cases in which patients received acetarsone (stovarsol). Three patients were quite ill for a week; the others were moderately sick and the symptoms abated in from forty-eight to seventy-two hours. Severe peripheral neuritis occurred in one case, recovery from which took almost a year. A second but milder case occurred, and the patient was well in from six to eight weeks. In both instances arsenic was present in the urine months after the administration of acetarsone had been stopped.

In view of these two cases of neuritis and thirteen of toxic erythema it was realized that the risk of treatment was considerable and that it was particularly dangerous to prescribe the drug unless the patient was under constant observation.

Flandin stated that the arsenic of treparsol was eliminated within two or three days after completion of a course of this drug. This suggested that the neuritic complication could be avoided and the immediate acute reactions perhaps lowered. Flandin's statement as to the rapidity of elimination was confirmed and, clinically, no cases of neuritis have occurred. Since 1925, 301 patients have received treparsol, and it was prescribed for others whose treatment was carried out elsewhere. There occurred eight, or 2.6 per cent, instances of toxic erythema in the 301 cases. One additional patient had nausea and vomiting after taking four tablets (1 gm.), and administration of the drug was discontinued rather than risk any chance of reaction. Four of these eight patients manifested erythema at the end of the first course (3 to 3.75 gm.), whereas four showed reactions during or toward the end of a second course of 3 gm. Symptoms of all subsided in from three to five days. While deaths from treparsol have been recorded, none have occurred in cases at the clinic.

While chiniofon ('yatren', 'anayodin') has been regarded with favour at the clinic and employed since 1926, it has not been the drug of first choice. Possibly

TABLE II
Results obtained with specific drugs

	'Cure'		Failure	
	Cases	Per cent	Cases	Per cent
Emetine ..	88	55	73	45
Ipecac ..	11	73	4	27
Arsphenamine	10	91	1	9
Acetarsone ..	112	85	19	15
Treparsol ..	34	89	4	11
Chiniofon ..	22	82	5	18

the earlier item of expense (when it was imported as 'yatren'), as well as the frequency with which it temporarily increased the diarrhoea, first led to the use of emetine, in conjunction with treparsol. Chiniofon is noted as being used in only thirty-seven of the 834 cases (table I). This gives a rather unfair picture, however, for most of these patients had received previous, and unsuccessful, treatment with emetine and arsenic. Aside from the rather frequent inconvenience of increased diarrhoea on the usual dose of 3 gm. daily, no untoward difficulties occurred. The two deaths that followed the intravenous administration of chiniofon in cases of actinomycosis are quoted constantly and indicate that the drug is not without some danger. However, the danger would seem minimal in the usual doses administered orally.

Vioform is another halogenated quinoline that has been used at the clinic. As it was available only during 1933 and 1934, it has been tried in only eighteen cases (table I). There were no difficulties and less irritation from its use than with chiniofon. As with carbarsone, we have had too little experience to offer any conclusions. Recently, a third compound of this group has been offered for trial, diiodohydroxyquinoline. In only one case has it been possible to follow up the patient, and in this case stool tests were negative three months after treatment.

The use of colonic irrigations of any of the foregoing medicaments has, unfortunately perhaps, not been tried. I have not been convinced that they added to the treatment, and no doubt there was an underlying prejudice against colonic irrigations.

As a matter of record, experiences with retention enemas of coal oil should be noted. In most instances there was no difficulty other than the attendant nuisance plus a persisting aroma of kerosene during treatment. A few patients would smell and taste kerosene in eructations of gas, which quite definitely was the result of reverse peristalsis. In one case a severe and rather dramatic reaction occurred. Immediately after receiving coal oil, the patient complained of a very tight feeling in the chest. The

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respiration rate rose to 36 per minute and the temperature to 102°F. Coarse râles were heard in both lungs. The patient was very restless and apprehensive, and grave anxiety was held as to the outcome. The symptoms slowly subsided, however, and in twenty-four hours he had entirely recovered.

SECTION II: RESULTS OF TREATMENT

In the evaluation of results of treatment it is essential not only to have later and repeated examinations of stools but also to have information as to what types of amœbiasis are encountered in any particular report. The effectiveness of treatment in a group of cases of latent amœbiasis might be quite different from that in a similar number of cases presenting hepatic abscesses or acute dysentery.

In this review, 278 of the 834 patients (33 per cent) had evidence of active amœbiasis on admission, 424 (50 per cent) had intermittent diarrhoea associated with various abdominal complaints, some of which were and some of which were not improved by anti-amœbic treatment, and 132 (16 per cent) were considered as having latent amœbiasis. In the latent group were listed fifty-one patients with chronic ulcerative colitis, in all of whom colitis had persisted after anti-amœbic treatment. There is no doubt that the relative percentage of latent cases can be varied almost at will, depending on how routine the examination of the stool is. Since the stools of patients who come to the clinic are not all examined and, further, as this group of 834 cases consists merely of those in which data as to treatment are available, the foregoing percentages do not give a true ratio of the incidence of the various degrees of amœbic infection in the north temperate zone.

Of the total group of 834 cases, 523 afforded sufficient data to warrant tentative conclusions as to the results of treatment. It is realized that in many the ideal of repeated examinations over a prolonged period has not always been possible, yet I believe that the follow-up data have been sufficiently adequate to indicate what has transpired (table II). The word 'cure' is used in this paper to imply that not less than two examinations of stools were made on successive days following completion of treatment, while in most cases repeated examinations were made over a period of months to several years. In addition, clinical symptoms of amœbiasis no longer existed. 'Failure' implies that the parasite was identified in the stool after treatment was completed even though there were no clinical symptoms. In contrast to institutional patients, our patients had returned to their original environment, so that reinfection might have occurred; yet we have considered as failures any cases in which the parasites were found after conclusion of treatment.

Treatment with emetine consisted usually in giving an average dose of 0.78 gm. (12 grains) over a period of four weeks. In most cases a series of kerosene enemata were given during the month, and in a number of cases chaparro amargoso was administered orally. Hence whatever virtue there may have been in kerosene and chaparro, they did not enhance the value of emetine as a curative agent to any marked extent. The observation of emetine failing as a curative agent in 45 per cent of cases is in accord with that of many other observers. Ipecac, in the few cases in which it was used, shows a better result, but one that is still far from satisfactory; in addition there is marked

TABLE III
Combinations of emetine and arsenicals

	'Cure'	Failure
Emetine and arsphenamine	7	..
Ipecac and arsphenamine	1	..
Emetine and treparsol	111	15
Emetine and acetarsone	13	3
Ultimate results with emetine and arsenic.	142*	8†

*94.7 per cent.

†5.3 per cent.

unpleasantness from its oral administration in 50 per cent or more of cases. Bismuth emetine iodide was frequently used to supplement other treatment, yet as a primary weapon of attack it seems to have been used in only two cases of which we have record, 'curing' the patient in one and failing in the other. Nausea and vomiting and diarrhoea occur in some cases, although they are less severe than with ipecac.

The primary results of treatment with the organic arsenicals is much better than with emetine or ipecac. Failure to obtain a cure, in addition to the occasional reaction, in only 9 to 15 per cent of cases, is most encouraging although still not at the desired goal.

Too few results are available on the efficacy of the oxygenated quinolines. It is not because of fear or prejudice but rather because there has been such a comfortable feeling with the emetine-arsenic regimen since before the quinolines were available that we have used them later more as 'shock troops'. In eight cases chiniofon (yatren) was used primarily, and in fourteen cases secondarily, for a total of twenty-two cures. Failure resulted in one case in which treatment was primary and in four cases in which it was secondary. This is not a just estimate of the drug's value, as the eighteen cases in which treatment was secondary indicate that a more stubborn infection existed. Likewise, too few results were available on the efficacy of carbarson and vioform. In only one case was vioform used alone; in this case active amœbic dysentery persisted in spite of the fact that emetine had been administered elsewhere to the point that peripheral neuritis had developed. Vioform failed to result in a cure. In two cases it was combined with treparsol and given but the results of treatment were unknown. Nine patients received carbarson, but data are available for only three of them. Used alone, carbarson failed to cure; in conjunction with chiniofon one patient was cured, and with emetine one failed.

The high percentage of failures with alkaloids and the much better results with the arsenicals naturally suggested the value of combining emetine and an arsenical, the former to be used only in sufficient dosage to control acute symptoms, thereby keeping well below even a minimal danger of poisoning, and the latter to be used in smaller doses and yet prove effective in eradicating the amœbas. The results noted in table III confirmed this opinion, for in 150 cases there were eighteen primary failures, or 12 per cent on treatment at the clinic. Ten of these patients were later cured, leaving eight regarding whom no further data were available. The final results were that treatment failed in 5.3 per cent and was successful in 94.7 per cent of the cases.

Results of treatment after original failure.—This is the group that naturally causes the most anxiety of all and serves as the stimulus to more effective treatment. As previously noted, the incidence of the more severe manifestations of amœbiasis is probably higher in the tropics, so that any reports from the north temperate zone may not be comparable to those originating in the Orient, in India or in Panama. In the 523 cases at the clinic 398 primary cures were obtained, but it is the 125 failures that are of the most concern (table IV). Striking improvement coincides with the wider use of the organic arsenicals. It also signifies that the profession has ceased to look to emetine as a curative agent but rather as a means of controlling the acute symptoms. Of the 125 patients whose original treatment failed, sixty were later cured; twelve persisted with the disease in spite of continued treatment, and for fifty-three no further data were available. It may be unfair to include all these fifty-three cases as final failures, just as it is rather optimistic to include all the remainder as true cures, but nevertheless sixty-five are listed as failures. But to consider these sixty-five as final and absolute failures is not justified, for as time goes on the majority of these present failures gradually become apparent cures, which observation has repeatedly been confirmed.

With present knowledge, the 'reclaiming of failures' lies in a systematic and conservative variation in the treatment. If failure has followed the use of emetine and treparsol, success is unlikely to follow their continued administration; likewise, the possibility of drug reaction increases. Two or three courses of chiniofon are prescribed (21 gm. a week, with a week's interval between courses). If amœbas persist, six weekly injections of arsphenamine or bismuth emetine iodide, with large doses of bismuth subcarbonate, are employed. In other words, varying the ammunition minimizes reactions to the drugs and seems more effective in finally

TABLE IV
Results of original and later treatment

	'Cure'		Failure	
	Total Cases	Per cent	Cases	Per cent
Original treatment				
1920 to 1925 ..	187	111	59.4	76
1925 to 1935 ..	336	287	85.5	49
TOTAL ..	523	398	76.1	125
Final results				
1920 to 1925 ..	187	152	81.3	35
1925 to 1935 ..	336	306	91.1	30
TOTAL ..	523	458	87.6	65

obtaining a cure. As one reviews the sixty cases finally considered as cured, the barrage of arsphenamine, emetine, bismuth emetine iodide, chiniofon, carbarsone, acetarsone, treparsol, vioform and ipecac is indeed startling, and one asks what good any one drug is when such a variety is used. In any event, a cure was eventually obtained.

Of the twelve cases in which failure persisted even after further treatment, five occurred in 1920 when more emetine and ipecac were given. One patient later received one course (4 gm.) of acetarsone, but without avail; at present I would not consider that sufficiently varied and persistent treatment had been given. One patient had a course of six injections of arsphenamine after the course of emetine had failed. Another patient received 152 gm. of emetine (24 grains) on top of an original course of 0.78 gm. (12 grains). The other five patients received fairly intensive treatment with emetine, acetarsone, treparsol and chiniofon, but in spite of this the parasites were not eradicated. Although these five cases were still failures, yet of the sixty eventual cures in the original 125 failures these sixty had as much or more treatment, some for two to three years. Hence it is hoped that judicious and varied treatment with the present drugs will result successfully in almost all cases of amœbiasis encountered at the clinic.

The figure 91.1 per cent as representing cases in which an apparently final cure was obtained in the past decade will undoubtedly provoke criticism, and I realize that, if repeated examinations of the stools of these patients could be made over a period of months, the final result would be less. On the other hand, instituting the programme of variation in further treatment makes me optimistic enough to believe that the final outcome would yield as high or even a higher percentage. As one respects the potential dangers of the drugs that are employed, so the recognition of the amœba as a wily and stubborn enemy results in a more determined and judicious management. Again it must be stated that those manifestations of the disease are not encountered when one considers, ileostomy or appendicostomy, or colostomy for rectal stricture.

Among the more serious complications of the disease to be dealt with should be noted clinically recognizable injury to the liver, which occurred in twenty-two cases. In sixteen cases there was abscess formation, whereas

in six there were chills, fever, leukocytosis, and tenderness in the region of the liver, which certainly suggests hepatic involvement. As has been stated, one of the patients was practically moribund on admission and died of general peritonitis. Drainage of the abscess had been established and 0.39 gm. (6 grains) of emetine

TABLE V
Results of treatment on amœbic rectal ulceration

	'Cure'		Failure		No data
	Total Cases	Per cent	Cases	Per cent	
Amœbic proctitis.	195	115	82 *	26	54
No proctitis ..	330	174	84 *	34	122
Chronic ulcerative colitis.	51	36	..	1	14

* Percentage based only on cases in which further data were available.

had been administered. Necropsy revealed that an abscess had ruptured into the peritoneal cavity.

In the remaining fifteen cases of known abscess aspiration or open drainage had been done, accompanied by anti-amœbic treatment. So far as we know, all these patients have been cured. Five of the six patients with hepatitis likewise have remained well, although the sixth, treated late in 1934, has written that she is still having some trouble.

With the exception of the patient who died and two others who were treated in 1920 and 1924, all patients received neoarsphenamine, acetarsone or treparsol in conjunction with emetine. In no case was there evidence of untoward reaction or of an increase in hepatic injury. In fact, in one case convalescence was prolonged and more complete recovery occurred only after treparsol was given; treparsol had been withheld for fear of injuring the liver. With even nineteen cases of hepatic injury it is not proper to state that the arsenicals are not dangerous, but in cautious and interrupted courses their administration has not only not caused harm but has proved beneficial.

Another aspect of the results of treatment of the more severe types of amœbiasis is seen in cases in which amœbic rectal ulceration could be demonstrated. Of 576 patients who were examined proctoscopically, 195 (33.8 per cent) had amœbic proctitis, 330 (57 per cent) were normal, and 51 (8.8 per cent) had idiopathic ulcerative colitis. The last were cases in which amœbas played only an incidental rôle and the colitis persisted after the amœbas had been eradicated. Several patients in the first group had some associated stricture, but only one had a marked tubular stricture. The last, a Nicaraguan, is one of a group of patients who received combined anti-amœbic treatment and local treatment of the rectum for more than three years; a cure was finally obtained and the patient had an adequately functioning rectum (table V).

PRESENT METHODS OF TREATMENT

If the patient has not received anti-amœbic treatment recently, he is given 0.065 gm. (1 grain) of Burroughs Wellcome & Co. emetine hydrochloride, subcutaneously, twice daily for three days. After an interval of a week, 0.043 gm. (two-thirds grain) of emetine is given twice daily for three more days. With the institution of the emetine, treparsol, 0.25 gm. (4 grains), is administered orally with each meal for four days. If there is no intolerance to arsenic, two more such courses are prescribed with intervals of ten days between the courses.

If the patient is quite ill, he is kept in bed for the first few days; if he is not particularly ill, hospitalization is not necessary. Obviously the diet may need to be bland and simple if there is much dysentery, but very rapidly, that is, within twenty-four to forty-eight hours, a full and generous diet is begun. In any depleting disease, adequate amounts of nourishing,

utilizable food are most essential. As recently demonstrated in experimental amœbiasis by the Tulane group (Faust, Kagy and others), the importance of a rich, high vitamin diet had a profound influence on the healing of amœbic ulceration. Hepatic involvement may subside, but if there is a large collection of broken down material, aspiration preferably, or occasionally open drainage, may be required.

If stool tests are positive following this regimen, three courses of chiniofon are prescribed: 3 gm. orally per day for a week and repeated for two more such courses, with a week's interval between courses. If diarrhoea is increased, the daily dose is decreased, thereby prolonging each course. Failure after this would indicate a course of one injection of arsphenamine weekly for six weeks, and 1 drachm (3.88 gm.) of bismuth subnitrate from three to six times daily during the period. As it was aptly expressed by Anderson and Reed, 'No one drug is known to-day to be completely effective..... and the therapeutic hazard should not exceed the disease hazard'. Hence there is need to vary the treatment in regard to the individual patient as well as to the type or degree of severity of the infection. With continued search for more effective and safer drugs, and with a better knowledge of the 'soil' of the patient, this present regimen will be simplified.

SUMMARY AND CONCLUSIONS

1. The use of 0.65 gm. (10 grains) of emetine hydrochloride subcutaneously in a month's time should involve a risk of reaction in less than 1 per cent of the cases.

2. The use of any of the present organic arsenicals is attended by some risk, but by observing the rule of interrupted courses as well as observation of the patient this risk is minimized.

3. In our experience at the clinic, acetarsone, treparsol and carbarsone have produced reactions. Clinically acetarsone produced the most and carbarsone the least.

4. The use of the arsenicals has not proved detrimental in the treatment of amœbic liver abscess.

Bacteriæmia and Oral Sepsis with Special Reference to the Ætiology of Subacute Endocarditis

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(Abstracted from the *Lancet*, Vol. II, 19th October, 1935, p. 869)

THE INVESTIGATION

In searching for the ultimate source of the streptococci concerned in the production of subacute bacterial endocarditis, attention must inevitably be turned to the oral cavity. Practically all observers are agreed that the vast majority of endocarditis streptococci are of the salivary or *Streptococcus viridans* type. These abound in the mouth and its neighbourhood but are only found elsewhere in small numbers and under exceptional conditions; above all it is in conditions or oral sepsis such as pyorrhoea of the gums that this type of streptococcus is found in the greatest numbers.

BACTERIÆMIA FOLLOWING DENTAL EXTRACTIONS

Our first observations were made on the blood of patients undergoing extraction of teeth from both septic and clean mouths. It is admittedly not easy to classify the different varieties of oral sepsis. Gum infection and apical infection are rarely mutually exclusive conditions. We therefore divided the cases roughly into three groups, A, B, and C, shown in Table I.

The blood was examined for bacteria in 138 patients undergoing the operation of extraction of teeth. Ten cubic centimetres of blood were taken from the arm veins immediately before extraction, and another 10 c.cm. within five minutes after extraction. The blood was added to 1.2 c.cm. of 5 per cent sodium citrate saline. Both samples of blood were usually taken while the patient was under the influence of a general anæsthetic—nitrous oxide, Evipan (intravenous), or ether.

Blood culture technique.—Each sample of citrated blood was distributed as follows. Two 1 c.cm. quantities were plated with 10 c.cm. agar in order to obtain a count of the viable organisms should the culture be positive. The remaining 8 c.cm. of blood was divided into two equal parts, each of which was added to 20 c.cm. of 0.1 per cent sodium citrate broth. One blood-agar plate and one blood broth were then incubated aerobically at 37°C. for seven days; the remaining implants were incubated anaerobically at 37°C. for the same period. The aerobic cultures were inspected daily for the presence of bacterial growth; it was found that where the culture was positive, growth often first appeared on the third or fourth day of incubation.

It will be seen from Table I, that of 138 cases of dental extraction, 84 (60.9 per cent) showed a transient streptococcal bacteriæmia after operation, and that in cases considered to be of a severe type of oral sepsis (Group A), the positive streptococcal cultures reached as high a figure as 75 per cent. In all cases where streptococci were recovered the organisms were of the non-hæmolytic type.

In the majority of cases where the result was positive streptococci were recovered from the cultures grown under both aerobic and anaerobic cultivation, and in few instances were the organisms found in the aerobic or anaerobic cultures only. None of the streptococci recovered were obligatory anaerobes.

In general, it was found that the occurrence and degree of a bacteriæmia depended upon the severity of the gum disease and the amount of damage done at the operation. Of 10 cases where one tooth was extracted and where there was no noticeable gum disease, only one gave a positive streptococcal blood culture after operation; this was one of removal of an impacted wisdom tooth. In 6 cases where two carious teeth were removed from an otherwise normal mouth, 2 gave a positive streptococcal blood culture after operation, the number of colonies growing being less than 1 per c.cm. of blood.

In 10 cases where a positive culture was obtained directly after extraction, a third specimen of the blood was taken at a period varying from ten minutes to eight hours after operation. After these intervals the blood was always found to be sterile. The bacteriæmia following extraction is thus of very short duration.

Organisms other than streptococci found in the blood following extraction of teeth.—While in the majority of cases non-hæmolytic streptococci were isolated in pure culture, in 6 of the 138 cases already described (in which the blood was cultured before and after extraction of teeth), diphtheroid bacilli were found in the blood taken immediately after operation. In 3 of these cases the diphtheroid organisms were in pure culture while in the remaining 3 they were present in streptococci. In no case were these organisms present in the aerobic and anaerobic cultures at the same time; in 5 cases they grew aerobically and in 1 case anaerobically. Two of these cases showed no gum affection. In 2 further cases included in the series of 138, staphylococci were found in the blood taken after extraction. These organisms were of the *albus* type; once they grew in pure culture, while in the remaining case they were mixed with streptococci. In both instances they grew only in the aerobic cultures.

The isolation of staphylococci and diphtheroids, both found so commonly on the surface of the skin, is possibly but improbably to be ascribed to contamination.

TABLE I
Streptococcal bacteraemia following extraction of teeth in 138 cases

Case group	Type	Cases examined	Result of blood culture after extraction	STREPTOCOCCAL COLONY COUNTS. AVERAGE OF AEROBIC AND ANAEROBIC CULTURES				
				<1 c.c.	1 to 5 c.c.	6 to 10 c.c.	11 to 15 c.c.	>15 c.c.
A	Marked gum disease; multiple extraction.	40	30 + 10 — (75 % +)	5	17	2	2	4
B	Moderate gum disease; multiple extraction.	60	42 + 18 — (70 % +)	14	21	4	1	2
C	Without detectable gum disease; extraction of one or more teeth.	38	12 + 26 — (34 % +)	3	9	—	—	—

+ indicates that streptococci were present in the blood culture.

— indicates that no streptococci were present in the blood culture.

c.c. = per cubic centimetre.

PYREXIA FOLLOWING EXTRACTION OF TEETH

In 20 of the cases where teeth were extracted from patients with pyorrhœa, the temperature was taken at half-hourly intervals over a period of twelve hours following operation. In 14 of these patients some degree of pyrexia was found to occur four to nine hours after operation; the temperature usually rose sharply to a level between 99°F. and 102°F. and remained at this height for two to four hours, after which it fell abruptly to normal again. In 3 a third specimen of blood was taken during the pyrexial period, but in all it was found to be sterile although streptococci were found in the sample taken *immediately* after extraction of the teeth. In 3 of the cases where pyrexia was observed the blood culture immediately following extraction was negative, while in 3 where there was no rise in temperature a bacteraemia immediately followed operation. Three further cases showed neither a positive blood culture nor pyrexia following operation.

These observations cannot be said to show any clear relationship between post-operative bacteraemia and pyrexia. The time relationship, however, between the trauma, the bacteraemia, and the pyrexia was very similar to that observed by Barrington and Wright in connection with catheter fever, and possibly bears the same interpretation as that suggested by these observers—*viz.*, that the pyrexia follows the bacteraemia at an interval similar to that which elapses between the injection of bacteria or protein into the circulation and the subsequent pyrexia (non-specific shock).

BACTERIÆMIA IN RELATION TO DENTAL SEPSIS

The most unexpected of our findings was that in 12 cases streptococci were isolated from a specimen of blood taken *before* operation. Of these, 9 were amongst the 100 cases of pyorrhœa referred to in Table I (Groups A and B), streptococci being found both before and after extraction of teeth. The remaining 3 cases were from an additional 10 cases of pyorrhœa in which only one examination of the blood was made, that being before extraction. Thus, among 110 cases of pyorrhœal disease, 12 (10.9 per cent) were found to have a streptococcal bacteraemia at the time of examination, irrespective of operative procedures. In 5 cases there was a definite increase in the colony-count of the specimen taken immediately after extraction of teeth, in 1 case there was a diminution in numbers, and in 3 cases less than one colony grew per c.cm. of blood, both before and after operation, so that no change in degree of the bacteraemia could be detected.

The blood of 2 of the patients was examined on two occasions, the tests being separated by an interval of a week. In both patients streptococci were found to

be present in the blood on the second but not on the first occasion. In 3 of the 9 cases where streptococci were found in the blood both before and immediately after extraction, the blood was examined again one to six hours after operation but was then always found to be sterile. It appears, then, that the inflammatory reaction following extraction closes down the field of absorption of organisms.

Organisms other than streptococci found in the blood before extraction of teeth.—In 6 of the 110 cases of pyorrhœal disease mentioned above, staphylococci were isolated in pure culture from the blood before dental extraction. All six were of a severe type of gum disease. Two of the six staphylococci were hæmolytic for horse blood, one being of the aureus type.

DISCUSSION

From time to time cases of subacute bacterial endocarditis are met with which follow the extraction of one or more teeth. The foregoing observations indicate the source and mode of infection in such cases. The transient bacteraemia following operative trauma is analogous with that described by Barrington and Wright in catheter fever where *B. coli* was the usual organism isolated from the blood.

More interesting is the observation that in persons with severely septic mouths non-hæmolytic streptococci (mostly of the *viridans* type) may enter the blood stream in the absence of any obvious trauma. Owing to difficulties of access to patients our own observations on this point are very incomplete. We have been unable to ascertain whether the condition of 'leak' into the blood stream in the positive cases is continuous, intermittent, or merely a fortuitous single occurrence. Nor have we yet determined whether minor degrees of trauma, such as brushing the gums or chewing, have any effect on the occurrence of the bacteraemia. There are, however, certain implications from which it is difficult to escape. From the nature of the technique it is likely that many cases in which streptococci enter the blood stream were missed. The efficient mechanism which exists for clearing the blood stream of organisms of low virulence no doubt only allows a 'leak' of organisms into the circulation to be detectable in blood from an arm vein when the 'leak' exceeds a certain magnitude or the organisms are abnormally resistant to phagocytic clearing. The small percentage of cases in which this non-traumatic 'leak' was observed probably gives an under-estimate of the risk of streptococci entering the blood of persons with severely septic gums. The bacteraemia observed under these conditions is obviously not an infection of the blood in the ordinary sense but is rather a 'leak' of relatively

non-pathogenic organisms into the general circulation followed by their rapid removal by the phagocytic action of the body. It is generally admitted that damage or malformation of the valves is a frequent if not a necessary predisposing cause of subacute bacterial endocarditis. It is easy to imagine that the 'leak' which is of little account in the normal person might determine the infection of diseased or malformed valves. At least the direct observation of such an invasion of blood as we have described provides a tentative explanation of how streptococci reach the heart valves in cases of subacute bacterial endocarditis and one in agreement with views which are widely held on theoretical grounds.

SUMMARY

(1) Within a few moments after the extraction of teeth from obviously septic mouths, a transient streptococcal bacteraemia lasting a few minutes may be observed in 75 per cent of cases. (2) Even in patients with mouths showing no obvious gum disease, extraction of teeth is followed by a transient streptococcal bacteraemia in 34 per cent of cases. (3) Of 110 persons with septic mouths 10.9 per cent were found to have a streptococcal bacteraemia irrespective of any operative interference. These observations were based on the examination of the blood on a single occasion. (4) The organisms isolated from the blood in the majority of cases were streptococci of the *viridans* type which were culturally and serologically similar to strains derived from the mouth. (5) The possible bearings of these observations on the aetiology of subacute bacterial endocarditis are briefly discussed.

Trichomatous Conjunctivitis: Its Surgery and Pathology

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(Abstract taken from the *Lancet*, 25th January, 1936, p. 215, of a Hunterian Lecture delivered at the Royal College of Surgeons of England on 17th January, 1936)

DURING the last thirty years trachoma has become a comparatively rare disease in London. Ophthalmologists can realize with difficulty that the stigmata of the disease are borne by as many as half the inhabitants of the globe. For it is practically universal among the Mongolian and Semitic races, and among the Red Indian tribes; it is also widely spread among the Caucasians of India, and among the Malaysians. Nevertheless, our knowledge of the aetiology of trachoma is incomplete; the clinical diagnosis may be impossible in the absence of bulky and expensive apparatus, and no aids are to be obtained by means of chemical or microscopical tests; while the treatment has not improved during the last thirty years.

PATHOLOGICAL ANATOMY

The response to attack by the virus of trachoma is a generalized flooding of the subepithelial tissue of the conjunctiva with lymphocytic cells. Typically, there are in addition special aggregations of these cells, which have been called follicles; however, in some cases no such follicles are to be differentiated from the general exudate of lymphocytes (Mikhail). The follicles, when present, differ in no way from similar aggregations of cells which appear in the condition known as follicular conjunctivitis. The conjunctival epithelium first proliferates, and then becomes villous; or it ulcerates and becomes replaced by scar-tissue epithelium.

The numerous underlying sebaceous or meibomian glands are at first affected by simple blockage of ducts and dilatation, the result of pressure by the cellular infiltration. Later the ducts become strangulated by the developing connective tissue, which begins to take the place of the lymphocytic exudate. The result is the appearance on the surface of the conjunctiva of

numerous bleb-like excrescences, which burst on pressure, giving vent to gelatinous matter, the retained secretion of the sebaceous glands, with numerous cells. These bleb-like excrescences by all trachomatologists up to the present time have been looked upon as the follicles, described above, which have become dilated. There is no evidence that such dilatation occurs, nor has anyone ever observed such a phenomenon to develop. It would be impossible for such a metamorphosis of the follicles to occur. Mikhail also has observed the dilatations of the ducts of the meibomian glands, but has not connected them with the bleb-like excrescences of the second stage of trachoma.

The whole process, for the description of which I am indebted to Pulvertaft, is a chronic progressive inflammatory change, almost certainly due to a secondary infection of the subepithelial tissues, following a primary epithelial lesion. The difference between other forms of conjunctivitis and trachoma is that the effect of the virus is much more lasting in trachoma, leading to this enormous subepithelial exudate, which penetrates to the tarsus, and via the fornix conjunctiva to the upper corneal limbus. The natural end of this severe exudate is its transformation into cicatricial tissue, thereby differentiating trachoma from other forms of conjunctivitis. The involvement of the tarsus in the cellular exudate, and the subsequent cicatrization which occurs, leads to thickening of this boat-shaped structure, and so to entropion. The trichiasis which accompanies the entropion is due to the development of supernumerary lashes by offshoots from existing hair follicles. This new development is caused by the hyperaemic condition of the lid margin which always occurs in serious cases of trachoma.

The hypertrophy of the superficial conjunctival epithelium leads to the appearance of numerous polygonal areas, which form a papillary hypertrophy. This is the result of irritation and is present in all forms of long-continued inflammation of the conjunctiva.

Pannus

The term pannus was originally applied to the cloth-like opacity which the cornea of an inveterate case of trachoma exhibited. Completely ignorant of the pathology of the disease the surgeons of a former day used to attempt its removal. We now understand the term pannus to apply to an infiltration of the clear cornea by a cellular exudate, which is accompanied by the vascularization of a previously avascular tissue. This may be observable only by optical magnification, or may be obvious to the naked eye. Following the primary epithelial lesion of the conjunctiva by the trachoma virus, whatever its nature may be, there is an infection of the subepithelial tissues to which response is made by a widespread inflammatory exudation. This spreads from the site of origin, near the retrotarsal fold, to the fornix, travelling beneath the epithelium, and from the fornix proceeds to the upper part of the limbus of the cornea. In this area pannus appears, which in early trachoma is the only pathognomonic sign of the disease.

Mikhail has made it quite clear that the changes at the upper corneal limbus occur in this way, and that the limbus does not become infected from the trachomatous conjunctiva of the upper lid by contact.

The cellular invasion of the cornea has spread in the subepithelial tissue from the fornix. An increased vascularity is the response to this irritation. From the convexity of the end capillary loops of the cornea new vessels are developed which run centripetally towards the centre of the cornea with few anastomoses.

The cellular invasion appears first as an indefinite grey infiltration at the limbus, which often becomes concentrated into a number of tiny grey elevations. These are about 0.2 or 0.4 mm. in diameter. They are separated from one another by the new vascular channels just described. The cellular infiltration accompanied by new vessels inserts itself between the corneal epithelium and Bowman's membrane. In severe cases

Bowman's membrane may become partially destroyed, when the infiltration will penetrate between the layers of the corneal stroma. Marked opacity is thus produced, which becomes permanent on conversion of the inflammatory exudate into cicatricial tissue. The folly of an attempt 'to cure pannus' by peritomy or other ill-conceived measures, therefore, becomes apparent.

Four main points are of importance in our conception of the disease and in its diagnosis.

(1) The primary epithelial lesion caused by the virus results in an inflammatory reaction in the subepithelial tissue, exhibited by a lymphocytic infiltration. The lymphocytes may be aggregated into follicles, but this is not always the case. When such follicles are present they cannot be distinguished pathologically from similar aggregations of cells which occur in follicular conjunctivitis.

(2) This lymphocytic invasion of the subepithelial tissue spreads from its area of inception in the tarsal conjunctiva to the upper fornix, and thence in the bulbar conjunctiva to the corneal limbus, where changes occur peculiar to trachoma.

(3) The bleb-like excrescences, which exude a gelatinous material when ruptured, have no relation to the so-called trachoma follicles of an earlier stage of the disease.

(4) The lymphocytic invasion of the subepithelial tissue penetrates the tarsus, and finally is resolved into connective tissue. Hence result the deformities of the lids which occur in no other form of conjunctivitis.

The last three points differentiate trachoma from any other form of conjunctivitis.

CLINICAL MANIFESTATIONS

In heavily trachomatized countries such as Tunisia, Egypt, and Palestine, the disease is frequently discovered during the course of, or during convalescence from, an attack of acute bacterial conjunctivitis. But, as Charles Nicolle has said, the acute conjunctivitis is the occasion of the diagnosis, and not the occasion of the disease. The majority of the inhabitants of these countries become infected during the first two years of life. Born of trachomatous mothers, and suckled for nearly two years, it can be only by a miracle that infection will be avoided.

Typically the disease begins imperceptibly. Atypically and rarely it begins with acute symptoms such as pain, lachrymation, and photophobia, in the absence of bacterial infection. But these acute symptoms appear when the disease has already developed, as the result of roughnesses of the upper palpebral conjunctiva, which cause irritation of the corneal nerves. So this is an exacerbation of an existing condition, and not an acute onset. We can now enunciate a definition of trachoma.

Trachoma is a specific contagious disease of the conjunctiva in man. It is chronic in nature. It is characterized by a subepithelial infiltration of the conjunctiva by a cellular exudate, which spreads to the tarsus and to the cornea. It is followed by cicatricial changes in the affected tissues.

Four stages

The disease is divided into four stages, according to the comparative prominence of subepithelial lymphoid infiltration, bleb-like excrescences which burst on pressure, papillary hypertrophy, and connective tissue formation.

(i) After an incubation period of from 4 to 10 days, the first stage makes its appearance by a subepithelial infiltration. This infiltration is usually, but not always, concentrated into tiny greyish islets, the so-called follicles; these form slight roughnesses, and first appear at the extremities of the tarsal conjunctiva at its upper border.

The virulence of the trachoma virus is such that the subepithelial infiltration rapidly extends to the conjunctival fornix, and from thence to the upper corneal

limbus. Pannus is present as soon as the condition can be diagnosed; in fact the diagnosis rests on detecting pannus with the corneal microscope.

(ii) The second stage has been divided into sub-groups for application to different clinical appearances which are common in the East. For present purposes only one need be mentioned. Here there are numerous bleb-like excrescences, which rupture on pressure, with emission of gelatinous material. These are dilated ducts of sebaceous or meibomian glands. They have no relation to the tiny follicles of the first stage.

(iii) The third stage shows the resolution of the inflammatory infiltration commencing and its replacement by scar tissue. Typically there are islands of inflamed conjunctiva surrounded by a cicatricial network. There is always some thickening of the tarsus by inflammatory products, often leading to entropion.

(iv) In the fourth stage all inflammatory changes have come to an end. The tarsus is covered by scar-tissue epithelium and there is more or less cicatricial change in the thin subepithelial tissue and in the tarsus.

Ætiology

Now that the interest in the organism discovered by Noguchi, and reported by him as the causative agent of trachoma, has entirely evaporated, we are left with a theory that the disease is caused by a virus, and has some relation with certain inclusions in epithelial cells. These inclusions were first described by Prowaczek and Halberstaedter, who made experimental investigations in Java. They are not peculiar to trachoma, but are found in other ocular diseases, such as non-gonococcal ophthalmia neonatorum, follicular conjunctivitis, and swimming-bath conjunctivitis. They are indistinguishable from those found in certain known virus diseases, such as vaccinia, fowl-pox, varicella, herpes, and psittacosis.

PRINCIPLES OF TREATMENT

It must be understood that the disease is a local one, confined to the eyelids and the cornea; that it confers no immunity until the normal epithelium has been replaced by scar-tissue epithelium; and that it produces no recognizable blood reactions. The result of the action of the trachoma virus is an infiltration of the conjunctiva and cornea with lymphocytic cells. This is a manifestation of the defensive mechanism of the body tissues and fluids; the question immediately arises as to the utility of attempting to destroy this phenomenon, for no chemical or biological agent has been shown to have any neutralizing effect on the activity of the disease.

It is in the first stage of the disease that these doubts assail our minds. In the second stage, with its bleb-like excrescences, it is clearly necessary, by mechanical means, to get rid of the retained secretion in the blocked ducts of the meibomian glands. In the third stage the application of irritants, such as copper sulphate, is supposed to favour the deposition of fibrous tissue, at the expense of the lymphocytic infiltration.

A distinction must be drawn between 'mass' and 'individual' treatment.

Mass treatment at a clinic, where the actual manipulation of the lids is entrusted to nurses, is unsatisfactory; it is doubtful if it is preferable to the daily instillation of antiseptic or astringent drops by the patient himself. Individual daily treatment by an experienced ophthalmologist gives a better result, with the minimum amount of cicatrization.

The principal sequelæ of trachoma are trichiasis and trichiasis-entropion. Some of the operations, which have been proposed to rectify the condition, should never be performed: such as Burrow's operation, which is usually followed by a recurrence; Gaillard's sutures, which depend on suppuration for their effect; and Flarer's operation, or scalping of the lid margin, which results in permanent misery for the patient; for the lash-less lids roll in, and become macerated by the

conjunctival secretion. The principles which should govern operations are:

(1) The epilation of lashes should be strictly forbidden.

(2) The eyelid should not be fixed in a clamp for operative purposes, but should be stretched on a metal shoe-horn.

(3) No skin should be removed from the lid.

The operations to be recommended are Streatfield's operation in which horizontal wedge-shaped strip of the tarsus is removed from its anterior surface, and Van Millingen's operation in which a mucous membrane graft is inserted in the free border of the lid posterior to the lashes.

PROPHYLAXIS

In Egypt, Tunisia, Syria, and India the employment of native nurses for European children entails severe risk of trachomatous infection. In the annual report of the Public Health Commissioner with the Government of India for 1933, it is stated that at King George's Royal Indian Military School, Ajmer, the trachomatous boys have not been segregated from their healthy comrades during the last years on the advice of the Poona ophthalmologist. The report goes on to state that no new cases of trachoma have been reported as the result of this measure. This sounds satisfactory; however, as there is no information as to whether the trachomatous boys had regular daily treatment applied to their eyelids, for the purpose of preventing infection, it is not convincing. To be so it would be necessary to have a record of the corneal microscopy of all supposed healthy boys.

If at a private school or at the house of a public school, where a son of mine was attending as a boarder, it came to my knowledge that a boy with active trachoma was admitted, I should at once remove my son. I have seen a boy infected with trachoma at a day school for English boys in one of the Crown colonies. I have also seen the serjeant-major of a territorial regiment become infected after a period of duty with an Indian regiment.

Calcium Cyanide Dust in Ship Fumigation

By C. L. WILLIAMS

(From *Public Health Reports*, Vol. LI, 7th February, 1936, p. 139)

AMONG the procedures introduced of late years as improvements in ship fumigation, one of the most important has been the direct injection of fumigating gases into rat harbourages as a preliminary step to general gassing of the whole ship. By this procedure the fumigant is directly introduced into the spaces where the rats seek protection instead of depending on slow, haphazard, and unreliable penetration and diffusion.

It would appear that an improvement of this type would be generally taken up at once, but such has not been the case. As a matter of fact, it can hardly be said to have been taken up at all, the use of such procedure in the United States at the present time being restricted to two or three quarantine stations.

The reason for this is really not far to seek. Quarantine officers in general appear not to be prone to adopt readily procedures that represent additional work and hazard; obviously, direct injection of rat harbourages is of this type. However, all quarantine officers cannot be held at fault; at some stations the apparatus and specially trained personnel required cannot be reasonably maintained, and it must be admitted that in utilizing liquid HCN as an injection material the method is somewhat laborious and adds distinct hazards.

Attempting to view human nature as it is and not as he would like it to be, the writer has endeavoured during the past 2 years to develop simplified and safer methods of directly injecting hydrocyanic acid gas into

rat harbourages, with the hope that thereby a procedure might be developed so simple and relatively safe that its adoption at all major quarantine stations could reasonably be insisted upon. The use of calcium cyanide dust is offered as such a method.

METHOD OF PROCEDURE

As a matter of fact, direct injection of rat harbourages with calcium cyanide dust is simplicity itself. The dust is taken from a tightly covered can, in which it is marketed, by dipping it up with a large spoon or small cup. It is poured into the container of a foot-pump type of duster, this container then being screwed in place. The rubber hose extending from the duster (fitted with a nozzle if desired) is inserted into small openings into harbourages by a fumigator while another operates the pump, usually 2 to 4 strokes in each harbourage being sufficient. If the enclosed spaces to be treated are few or of limited extent, the whole operation might be carried on, even in the hold of a ship, without the wearing of gas masks by the fumigators. If, however, many harbourages are to be treated or they are extensive, gas-mask protection is necessary.

CALCIUM CYANIDE

The material used, calcium cyanide [the formula of which is $\text{Ca}(\text{CN})_2$], is manufactured in this country in the process of manufacturing cyanamide for use as a fertilizer. So far as the writer is aware, it is at present manufactured in the United States only by the American Cyanamid and Chemical Corporation, under the trade name Cyanogas. It is also manufactured in Germany, the German product being sold in this country under the trade name Calcyanide.

Cyanogas is obtainable in flakes, granules, or as a dust, the latter being quite fine, most of the particles passing a 200-mesh screen. Calcyanide is at present obtainable only as a fine dust, although it is available abroad in the form of briquets, which are usually broken into a dust for use. Cyanogas is blue in colour, while Calcyanide is a light brown. Cyanogas contains from 40 to 50 per cent calcium cyanide, while Calcyanide contains from 80 to 85 per cent calcium cyanide. This is an important point to remember, since in interchanging these materials the Calcyanide must be used in approximately half the amounts of Cyanogas. For use in the foot-pump duster, the form of Cyanogas to be specified is the 'A' dust.

The action of calcium cyanide is based upon the fact that it takes up moisture from the air to form hydrocyanic acid and calcium hydroxide; the former is liberated as a gas. The thinner the layer exposed to the air, the more rapid is the reaction. When a duster is used, the dust is blown out as a cloud and the reaction with the moisture of the air is almost immediate, continuing up to the point where the moisture present is exhausted. The limiting point is not reached when calcium cyanide is used, as described herein, for ship fumigation. The amount of HCN produced is approximately one-half the weight of the calcium cyanide entering into the reaction. Therefore, when Cyanogas is used, the HCN produced will be between one-fifth and one-fourth of the weight of the raw material. When Calcyanide is used, it will be approximately two-fifths of the weight of the raw material.

The reaction between water and calcium cyanide is reversible, that is, the calcium hydroxide in the presence of hydrocyanic acid takes up this material to produce calcium cyanide and water. This is of some importance where large amounts of calcium cyanide are used and it is spread in relatively thick layers. Where the material is dusted widely in relatively small amounts, however, the amount of HCN that will be retained in the residue is not likely to be dangerous.

FOOT-PUMP DUSTER

The foot-pump duster that has been used in experiments with Cyanogas and Calcyanide is one supplied

commercially by the American Cyanamid and Chemical Corporation and is built for the purpose of dusting their Cyanogas 'A' dust. This duster operates equally well, however, with Calceyanide. The device consists of an air pump attached to a stirrup at the bottom; one foot is placed in the stirrup to hold the apparatus steady while pumping. The stirrup is tall enough to accommodate a one pint glass mason jar or a similar jar made of aluminium, which is preferable. The jar screws into a fitting on the bottom of the pump. Air from the pump passes into the jar through a check valve and out of the jar through a delivery hose. On the down stroke, about one-fifth cubic foot of air is blown at high velocity through a small opening into the container, where it stirs up the dust and carries a portion of it out through the delivery tube. Approximately 1/12th ounce of the dust is delivered at each stroke.*

DOSAGE

The vast majority of rat harbourages are either of small capacity or are subdivided into small spaces. When subdivided, of course, each subdivision must be separately injected. As a rule, a harbourage or a subdivision will not be of more than 10 cubic feet capacity, and often is of not more than 2 or 3 cubic feet capacity. Since the foot-pump duster delivers about 1/12th ounce of the dust per stroke, the Cyanogas 'A' dust delivered by a single stroke will, in a pipe casing of, say, 4 cubic feet capacity, produce a theoretical HCN concentration of about 3½ ounces per 1,000 cubic feet. If Calceyanide is used, the concentration will be about 7½ ounces per 1,000 cubic feet. Two strokes, of course, will produce approximately twice these concentrations in such a space.

In experimental work with pipe casings, it was found by titration of the HCN present that the theoretical figures cited were not actually attained, probably because of absorption of gas and leakage. Furthermore, in considering this problem one must bear in mind that, in practice, leakage will be considerable and that the concentration will rapidly fall unless the harbourage injected is of very tight construction.

* Recently this duster has been improved by attaching a by-pass valve, permitting air alone to be pumped through the hose, so that a charge of dust may thereby be widely distributed. A duster with a 2-quart dust jar is obtainable.

In actual practice on ships, a number of different dosages were utilized; but it was found that, for the majority of harbourages not in excess of 10 cubic feet capacity, four strokes of the pump when Cyanogas was used, or two strokes of the pump when Calceyanide was used, gave excellent results in rat destruction.

SAFETY

In distributing calcium cyanide dust with a foot-pump duster as described, the hazard to the operators is low. This is due principally to the fact that while high concentrations of HCN are produced in the restricted harbourages, the actual amounts of dust liberated are so small that concentrations in the open ship's hold remain quite low. So far as the apparatus is concerned, the only hazard of any material importance is the possibility that the dust container may become loosened and drop off just as the pump is operated. This would cause a blast of dust to fly up in the face of the operator. Danger from such an accident can be entirely obviated if the operator wears a gas mask. In actual practice during experiments to test this material, no such accident has occurred, and no fatalities from such accidents are reported in the literature despite the fact that this type of dust pump is extensively used in destroying burrowing rodents on farms throughout the United States.

Because the absolute amounts of dust injected into harbourages are small, the dangers from gas being held in these harbourages and later escaping into the ships' holds after they have been cleared is practically nil. This is apparent when one considers that the harbourage is of only a few cubic feet capacity while the hold is from 30,000 to 100,000 cubic feet in capacity. An amount that may produce a high concentration inside a 4-cubic foot pipe casing becomes hardly more than a smell when liberated into the open hold.

FUMIGATING HOLDS

Calcium cyanide dust may also be readily utilized to fumigate ships' holds by blowing it into them with compressed air or some type of centrifugal blower. A vacuum cleaner with the bag replaced by a delivery hose does very well; it can be utilized also in the superstructure, but there presents the disadvantage that the fine dust, universally distributed, presents a subsequent cleaning problem.

The Calceyanide Co. also offers an apparatus wherein the HCN is extracted by air in a large bag and the gas-laden air, free from dust, is delivered through a hose, which obviates the cleaning problem.

Reviews

PHARMACOPŒIA AND GUIDE. Art Press, Calcutta. 1936. Pp. xi plus 153. Price, Rs. 2-8

THIS small book is an opportune production because, as far as we are aware, it is the first hospital pharmacopœia to be published from a hospital dealing specially with tropical diseases.

The first section is devoted to standard formulæ and there is nothing specially original in this section as it is mainly composed of the usual prescriptions found in hospital pharmacopœias, in fact many of them have been copied from those of well known London hospitals, but a few will not be found in the latter. There is an important departure from the normal, however, in that all prescriptions are written in full and in plain English, a valuable point for persons not grounded in Latin. This section is followed by a posological table of pharmacopœial drugs and tables of weights and measures. This portion occupies fifty-five pages, almost exactly one-third of the book.

It is in the latter two-thirds that the true value and unusual character of the book, as a hospital pharmacopœia, will be found, for here are given summaries of

diagnosis and treatment of all the tropical diseases one encounters in India, and this portion is of great practical value as each section has been compiled by the specialist workers of the Calcutta School of Tropical Medicine and it embodies all the methods they have found by long experience to be of greatest value.

In addition to this there are guides to laboratory procedure in carrying out the most important biochemical tests in use, and tables of normals, making it quite useful as an emergency laboratory handbook. There are also long lists of the food value of the ordinary articles of diet with a special table dealing with the fruits and vegetables common in India, and which play such an important part in the diet of the people of this country.

It is impossible in a brief review to enumerate all the good points in a book of this nature, but it is felt enough has been said to indicate its value.

This book is of pocket size being printed on thin paper of good quality and with a soft cover, and it is felt that it will meet a ready demand, first in India and the East where the diseases dealt with exist, but

it would also be of great use in any tropical country, and even a practitioner in England might find it a help if suddenly faced with a tropical complaint and without any textbooks at hand.

The price Rs. 2-8 is very reasonable and remarkably good value, and the Calcutta School of Tropical Medicine and the publishers are to be congratulated on its production.

REGENERATION IN MAN.—By M. A. Ansari. 1935. D. B. Taraporevala (Hornby Road, Fort), Bombay. Pp. xx plus 208. Illustrated. Price, Rs. 8. Obtainable from Messrs. Kegan Paul Trench Trubner and Company, Limited, London

The first portion of this book is devoted to a survey of the early work on the subject of regeneration beginning with the observation of Brown-Sequard and tracing the development of the technique up to the work of Voronoff and Steinach.

In the latter part the author describes the different methods employed and gives illustrative cases from among the large number he has operated upon.

The book is a good summary of our present knowledge on the subject of regeneration in man, and is clearly written in simple language. Typographical errors are remarkably few, the book is well printed, the illustrations excellently reproduced. It is one of the best examples of the printer's art we have encountered which has come from an Indian publishing house.

CHILD PSYCHIATRY.—By Leo Kanner, M.D. 1935. Baillière, Tindall and Cox, London. Pp. xviii plus 527. Price, 27s.

It is hardly a matter for surprise that this remarkable book is an end-product of American research in view of the prominence that pædiatrics has attained in the United States. This is the first textbook on child psychiatry to be published in the English language, hence the English-speaking world should be grateful to the Josiah Macy Jr. Foundation, as well as to the Rockefeller Foundation for providing the funds for the research upon which this book is founded. Dr. Kanner's outlook on mental disorders in children is based on the teaching of the eminent American psychiatrist, Dr. Adolf Meyer, which is that of objective psychobiology. As Dr. Kanner observes, of late years, a compromise has been attempted between the dualistic principle of interaction between body and soul and the monistic tenets of a dominance or sole existence of either 'mind' alone or 'matter' alone. In other words, the concept known as *psychophysical parallelism*, which assumes a coincident but otherwise not inter-dependent 'parallel' running together of a mental and a physical aspect. With this attitude as a background, child psychology becomes an objective and concrete study of the mentally integrated individual during the natural progress of maturation. Dr. Kanner explains the nature of the psychobiological approach in the following words: 'A child is brought to the physician's attention with a complaint. This may consist of a lesion of the skin, an exanthematous condition, otitis media, whooping cough, or constant blinking. It will, in every case, become necessary to obtain a careful history of the onset of the difficulty, the mode and circumstances of its first appearance, its development up to the time of the consultation, and the therapeutic attempts already undertaken.... The complaint may be of such a nature that it does not involve the child's personality in the least, beyond the desire on the part of the patient, or the family, or both, to have it corrected: a furuncle, a sprained ankle, uncomplicated varicella, the transient results of casual over-eating.... There is a vast range between these disorders and such complaints in which the patient's personality is very obviously and conspicuously in the foreground, as in temper tantrums, hypochondriasis, obsessive thinking, persistent day-dreaming, masturbation, excessive restlessness, truancy or stealing. In order to do equal justice to these, and similar, sometimes not so strikingly personality-determined difficulties, one would have to

study carefully the child's personality'. In the first nine chapters, Dr. Kanner deals with the problems of examination and diagnosis, beginning with a chapter devoted to the general consideration of the examination of children. Thereon follow eight chapters which deal with special points of the examination problem. These special points comprise, the complaint factor, the age factor, the somatic factor, the intelligence factor, the emotional factor, the sex factor, the constitutional factor and the environmental factor. Each point is admirably illustrated by copious citations from actual case histories. The author then passes on to the consideration of the principle and aims of psychiatric treatment. Under this heading, he includes work with the child, work with the family and work with the community. The remainder of the book is divided into three main sections: (1) personality difficulties forming essential features or sequels of physical illness; (2) personality difficulties expressing themselves in the form of involuntary part-dysfunctions; (3) personality difficulties expressing themselves clearly as whole-dysfunctions of the individual. The concluding chapter deals with the subject of suicide among children. Indian readers of this book, unacquainted with the conditions of the poor in Europe and the United States, will experience feelings of surprise amounting to consternation, when they learn of the amount of ignorance, cruelty, and gross superstition which still persists among races which pride themselves on their 'superiority'. Indeed, those readers who are acquainted with America and Europe, will be harrowed by the revelations of child life to be found in Dr. Kanner's clinical histories. From what Dr. Kanner has written about the facilities for the care of children, Indian readers may draw some comfort from the reflection that even in so wealthy and advanced a country as the United States, financial inadequacy, political meddling, the indifference and ignorance of legislators, the lack of progressivism and vision on the part of law courts in America, present endless difficulties and sources of obstruction in regard to the promotion of child welfare. Persons disgusted with the 'mumbo-jumbo' which passes for child welfare in this country will smile at the story of the wise judge who caused a girl of fifteen who had given birth to a child to be married to the baby's (putative) father. The couple lived together for exactly twenty-five days.

O. B-H.

HÆMOCHROMATOSIS.—By J. H. Sheldon, M.D. (Lond.), F.R.C.P. (Lond.). 1935. Oxford University Press, London. (Humphrey Milford.) Pp. xii plus 382, with 40 illustrations and 2 charts. Price, 25s.

PROFESSOR SHELDON'S interesting and illuminative monograph dealing with the various aspects of the hitherto unsolved problems of hæmochromatosis will no doubt be recognized as a classical work on the subject. The disease undoubtedly is a rare one and the present name was given by von Recklinghausen to a condition in which the organs and the tissues throughout the body are abundantly infiltrated with two pigments, one iron-containing identical with hæmosiderin, and the other appears to be the same as hæmofuscin.

The mysterious nature of the disease, which has eluded the vigilance of many workers in different parts of the world since the time of Trousseau (who appears to have first described a case in 1865) will be evident by the variety of names given to the disease by different workers in different parts of the world.

Though a very large volume of work has been done, the ætiology and the pathogeny of the disease are still conflicting and somewhat obscure. It is undoubtedly an inborn error of metabolism in which the characteristic features are pigmentation of the skin and the mucous membrane, hepatic cirrhosis and diabetes from which it probably got the nomenclature of 'bronzed diabetes'.

Dr. Sheldon has performed a big task in collecting data of 311 cases of the disease from the literature; he has analysed and then discussed the clinical and the pathological findings in a way which is indeed highly commendable. A complete picture of the disease has thus been presented to the readers, out of the materials obtained by him from the earliest times up to 1934. Such a complete summary of the records of hæmochromatosis is bound to be invaluable to anyone who wants to make further study of this particular or other allied subject.

Besides the carefully collected 600 references which the author has included in his bibliography, he has given a masterly exposition of the intricate subject of the mechanism of the pigmentation of the different organs and tissues with hæmosiderin in chapter VIII. and has offered a very reasonable hypothesis which may partially explain the phenomena of hæmochromatosis.

We have no hesitation in recommending the book to scholars and research workers interested in the subject of pigment and the mineral metabolism of the system.

J. P. B.

SURGICAL EMERGENCIES IN CHILDREN.—By H. G. Edwards, M.S. (Lond.), F.R.C.S. (Eng.). 1936. Baillière, Tindall and Cox, London. Pp. vii plus 274. Illustrated. Price, 12s. 6d.

MR. EDWARDS has added to the surgical literature a useful little book entitled 'Surgical Emergencies in Children'.

At first sight it may appear to some that surgical emergencies in children should receive the same sort of treatment as would be meted out to adults suffering from the same conditions.

Mr. Edwards declares that this is not so, and demonstrates in a clear manner his reasons for his opinion. He points out to the unwary that it is inadvisable to put a pin or a wire through the bones of a child, and therefore these methods of extension, so generally adopted in the adult, must in the case of children be replaced by plaster strapping. Appendicitis and intussusception, those two bugbears of childhood, rightly receive a great deal of attention; they are carefully dealt with and their complications described. We agree with the author that the giving of a spinal anæsthetic in cases of paralytic ileus, a form of treatment once so warmly advocated, is of little or no use. But we are surprised to note that he makes no mention of the use of acetylcholin in this condition, for the drug is useful, at any rate in the early stages of ileus.

Drainage of an empyema and the treatment of septicæmia are worthy of special mention.

The book is definitely good, it is well written, and it is obvious that Mr. Edwards is a keen observer. The volume should prove to be of great use, especially to the young surgeon at the outset of his career.

H. E. M.

MEDICAL RESEARCH COUNCIL. 'THE DETERMINATION OF IODINE IN BIOLOGICAL SUBSTANCES'.—By C. O. Harvey. Special Report Series, No. 201. 1935. Published by His Majesty's Stationery Office, London. Pp. 43. Price, 1s.

'It is well known that the element iodine plays a very important part in the metabolism of the body, and particularly in relation to the functions of the thyroid gland. The quantities involved are nevertheless exceedingly minute, and study of the subject is hampered by the difficulty of estimating them with accuracy in complex biological substances. The results of defective methods of estimating these minute quantities of iodine have indeed formed a lamentable chapter in medical science. It will be remembered that so long ago as 1850, Chatin began investigations into the distribution of iodine in foodstuffs and was led to formulate the hypothesis that simple goitre was related to deficiency of iodine—one of the earliest

instances of a deficiency disease, a type of ætiology now recognized as being so common. A Commission appointed by the French Academy of Science was unable to repeat his chemical findings and repudiated his hypothesis, with the result that the latter remained discredited until Baumann in 1895 discovered iodine in the thyroid gland. Chatin's hypothesis has since been completely vindicated by the work of McClelland in the United States and of von Fellenberg in Switzerland; moreover, the investigations in America of Marine and his colleagues have clearly shown the determining effect of the exogenous supply of iodine upon the morphology of the thyroid.

Even in recent years, however, difficulties and discrepancies have arisen in the course of investigations undertaken in different parts of the world to determine the relation of the iodine content of foodstuffs and water supply to the incidence of goitre in particular regions. This inquiry into the iodine content of soil and foods, in relation to the geographical distribution of simple goitre in Great Britain, yielded some suggestive indication, but the main conclusion was that further work on this and other aspects of the iodine problem could not profitably be undertaken until a more reliable method of chemical analysis for the purpose had been devised.

In these circumstances, the Council decided to promote the work which is now reported.

As the report will show, Mr. Harvey was successful in devising an improved and standardized method—based on Dr. W. H. Hurttley's modification of Professor Th. von Fellenberg's procedure—for determining small quantities of iodine in biological substances, such as blood, milk, and vegetable foods. Practical trial of it by Miss M. G. Crabtree, working for the Council at the Lister Institute laboratories at Elstree, and by Miss G. Mason, at the Rowett Research Institute, has shown that the method is capable of giving consistent results when parts of the same specimen are tested by independent analysis: their figures are incorporated in the report.

MEDICAL RESEARCH COUNCIL. 'REPORTS ON BIOLOGICAL STANDARDS. IV. THE STANDARDIZATION AND ESTIMATION OF VITAMIN A'.—Edited by E. Margaret Hume and Harriette Chick. Special Report Series, No. 202. 1935. Published by His Majesty's Stationery Office, London. Pp. 61. Price, 1s.

'DURING the last few years much has been done to make it possible to express vitamin potency in exact quantitative terms, by the improvement of methods of biological measurement and by the adoption of agreed standards. This meets the practical need for means of expressing the strength of the highly concentrated preparations of the various vitamins which are now available for therapeutic use, and the similar need in dietetics for means of measuring the vitamin content both of ordinary foods and of preparations in respect of which special claims are made by their manufacturers. The methods have also immediate value in introducing greater accuracy into fundamental research work in the field of nutrition.

The present international agreement on the subject of vitamin standards is the result of two conferences held in London, in 1931 and 1934, under the auspices of the Permanent Standards Commission of the Health Organization of the League of Nations. The decisions then taken had been made possible only by a great deal of preparatory research work, very much of which was done in this country. It is of a section of that work, concerned in particular with vitamin A, that this report gives an account.

At the first International Conference for the Standardization of Vitamins, in 1931, a provisional unit of vitamin A was established in terms of the biological activity of a sample of carotene. It was necessary to make this standard provisional, in the then imperfect state of knowledge, as it seemed clear that experience

would reveal possibilities of improvement. This was soon shown to be the case, for immediately after the conference several isomeric forms of carotene, including B-carotene, were isolated by various investigators; and, since it was evident that the standard carotene was a mixture, it at once seemed probable that a sample of a uniform substance could be substituted with advantage at some future date. A further point was that the crystalline form of the provisional standard had been found by some workers to be difficult to manipulate, making it desirable that any future standard should be issued in solution. The second International Conference, in 1934, accordingly adopted a solution of pure B-carotene as the permanent standard in terms of which units of vitamin A were in future to be expressed.

Much of the preparatory research work on the standardization of vitamin A, for both the International Conferences, was done by the members of a special sub-committee of the Accessory Food Factors Committee, appointed jointly by the Medical Research Council and the Lister Institute. In the course of this excellent team work all kinds of problems presented themselves, such as finding the best solvent for carotene and determining the conditions under which this substance remained stable in solution. In addition, completely new aspects of the subject arose, including the possibility of measuring vitamin A by a physical method, based on spectrophotometry, which necessitated a comparison of the spectrophotometric results with those obtained by biological methods. Thus researches were made which, although each separate item was possibly of minor importance, became in the mass of great interest to workers in the field. Some of the work had been published by the individuals concerned, but much remained unpublished: it was thought, therefore, that the collection and publication of all the investigations together would constitute an important record, very useful to other experts'.

MEDICAL RESEARCH COUNCIL. 'MEDICAL USES OF RADIUM. SUMMARY OF REPORTS FROM RESEARCH CENTRES FOR 1934'.—Special Report Series, No. 204. 1935. Published by His Majesty's Stationery Office, London. Pp. 45. Price, 1s.

'THIS report continues the accounts given in the twelve which have preceded it, of the research done with radium and radium emanation distributed by the Medical Research Council to selected centres in Great Britain and Ireland. On the clinical side, the report deals mainly with the treatment of various forms of cancer, but it contains also a brief section on the use of radium for some non-malignant conditions. In addition to describing work done during 1934, the report gives statistical data relating to the after-histories of patients treated in previous years. There is, further, a preliminary section dealing with purely experimental studies in the fundamental aspects of irradiation. The whole scheme of work is under the general supervision of the Radiology Committee, to whom the Council are indebted for the preparation of these reports. No account is included here of the research work in the treatment of cancer by "radium beam therapy" which the Council and other bodies are assisting under independent arrangements'.

MEDICAL RESEARCH COUNCIL. 'THE SOURCE OF INFECTION IN PUERPERAL FEVER DUE TO HÆMOLYTIC STREPTOCOCCI'.—By D. C. Colebrook. Special Report Series, No. 205. 1935. Published by His Majesty's Stationery Office, London. Pp. 99. Price, 1s. 6d.

'PUERPERAL SEPSIS, an infective condition due to the invasion of the body by harmful micro-organisms during childbirth, is not only a heavy cause of maternal mortality but also one of the great enigmas of medical science at the present time. On the one hand, medical

practitioners have for fifty years or more been living in an atmosphere permeated by teaching of the fundamental importance of antiseptics and asepsis. On the other hand, here is an infective state which still remains common in spite of greater precautions and better technical methods. These circumstances make the situation particularly challenging; and the challenge is not the less impressive because the condition occurs in what ought to be a normal physiological process, and often when there has in fact been little or no obstetrical interference. One thing is certain: a situation such as this must mean that knowledge of the problem of infection in general, and of this special aspect of the problem in particular, is imperfect, and that a solution can be attained only through better information about the factors at work.

It was in view of these considerations that the Medical Research Council were glad to give their support, in 1930, to the establishment of a "unit" of research in the subject at Queen Charlotte's Hospital, London, in the Bernhard Baron Memorial Research Laboratories attached to the new Isolation Block at Hammersmith. The funds which the Council were themselves able to provide for this purpose, in addition to the resources which the Hospital had available, were largely augmented by a generous subvention from the Rockefeller Foundation of New York, granted for a period of seven years. The particular inquiry here reported has also received some financial and other assistance from the Ministry of Health.

The present publication by Dr. Dora Colebrook is one of a number of valuable accounts describing the work done in the unit. Whereas it has long been known that the morbid agent responsible for most cases of puerperal sepsis is a streptococcus characterized by its ability to hæmolyse red blood corpuscles, it has been realized only in the last few years that the cocci having this property in common really comprise several groups and a number of sub-groups, of which only certain members are harmful to human beings. At first sight this would appear to complicate the problem from the point of view of the investigator, but in reality it does not: indeed the recognition of these different groups and sub-groups promises to throw much light upon the ætiological problems, not only of puerperal fever, but of a wide range of infections for which hæmolytic streptococci are wholly or in part responsible. In human pathology, that range includes scarlet fever, acute tonsillitis and epidemic sore throat, erysipelas, whitlow, impetigo, wound infections, "hospital sepsis", and perhaps acute rheumatism: in animal pathology, bovine mastitis, equine strangles, and other conditions'.

MEDICAL RESEARCH COUNCIL. 'REPORTS OF THE COMMITTEE UPON THE PHYSIOLOGY OF HEARING. III. THE LOCALIZATION OF SOUND'.—By H. E. O. James. Special Report Series, No. 207. 1936. Published by His Majesty's Stationery Office, London. Pp. 38. Price, 9d.

'THIS report is issued by the Medical Research Council on the recommendation of their Hearing Committee. It describes investigations which have supplemented the results of work published in an earlier report.

The research was directed to the solution of various problems of sound localization—the hearer's capacity to locate the origin of a sound reaching his ears. These questions included, especially, the effect of becoming accustomed (or "attuned") to a particular sound, continuous or repeated, upon the localization of other sounds heard immediately afterwards. This phenomenon had to be investigated as regards "attunement" to sounds heard with one ear and with both ears respectively. Study was also made of the part played in localization by differences in the intensity of the sound as received by the two ears.

The conclusions reached are of theoretical importance in the physiological and psychological study of the

phenomena of sound perception. They have also some interest from a practical standpoint, in an age when it is becoming more and more necessary to be able to perceive rapidly both the significance and the place of origin of many and varied noises, mechanically produced'.

BOOK RECEIVED.

WE have just received 'A Handbook of Tropical Therapeutics' by Brevet-Colonel Chopra, C.I.E., K.R.P., I.M.S. This appears to be a comprehensive and important publication; it contains 1730 pages. We hope to publish a review shortly.

Abstracts from Reports

THE REPORT ON THE WORKING OF HOSPITALS AND DISPENSARIES IN THE PUNJAB FOR THE TRIENNIUM 1932 TO 1934

OWING to the financial stringency, now fortunately drawing to a conclusion, the years 1932 to 1934 were necessarily of consolidation rather than advance. Schemes with which it was not practicable to proceed were those for the establishment of rural dispensaries throughout the province, the total completed out of the programme of 375 being 360, and the provincialization of hospitals and dispensaries, which by the end of 1930 had been effected in 45 places, since when only two other hospitals have been taken over by Government, viz, the Lady Aitchison Hospital, Lahore, in 1932, and the Civil Hospital, Rohtak, in 1934, the Government's hands being forced by the inability of the authorities in charge of them to provide funds for their maintenance. As soon as finances permit, the Government will proceed with its programme of provincializing 66 more district and tahsil headquarters hospitals and dispensaries.

In spite, however, of expenditure having had to be cut to the bone, there were a number of important measures, for which funds could be found, the most notable being the provision of facilities for radium treatment, and also a considerable increase in the number of beds at the Mayo Hospital, Lahore, the inauguration of the de Montmorency College of Dentistry and the completion of the Lady Willingdon (Maternity) Hospital. The very large number of patients treated at the dental hospital supplies ample clinical material for the students. The public demand, which existed for a Government maternity hospital, is demonstrated by the statistics for the Lady Willingdon Hospital, to which Indian women increasingly resort, and which also fulfils the important function of providing clinical material for the training of students at the King Edward Medical College in practical midwifery and gynaecology, and thus saves Government the expense formerly incurred in sending students for this purpose to Madras.

The Government is satisfied from the report that the chief Government hospitals, viz, the Mayo and Albert Victor Hospitals, Lahore, the Civil Hospital, Amritsar, the Lady Willingdon Hospital, Lahore, and the Lady Aitchison Hospital, Lahore, continued to be satisfactorily administered and to cater for the needs of an increasing number of patients. Until the latter hospital was provincialized, there was a danger of its coming to an untimely end. The necessity for its continued existence was great, as this is the only hospital in Lahore (and one of very few in the province) where medical attendance for women is provided entirely by qualified lady doctors.

The Government is gratified to observe that steady progress continues to be made with the provision of medical aid for women. The extent to which women are availing themselves of it is shown by the number of women patients at hospitals and dispensaries, which rose from 3,140,271 outpatients and 70,550 inpatients in 1933 to 3,249,818 outpatients and 76,537 inpatients in 1934. These figures refer to women patients treated at ordinary hospitals, as well as at women's hospitals or wards where lady doctors are available. Of the latter there are now 85 in all, 42 hospitals and 43 wards for women, under the charge of lady doctors; and of

these 85 institutions, 25 are maintained by Government, 32 by local bodies and 28 by missionary societies.

At the same time, gratifying progress has been made with medical education for women. The chief training centres are the Lady Hardinge Medical College, Delhi (for which the Punjab Government may nominate 7 students), the Punjab Medical School for Women, Ludhiana, to which is affiliated the Memorial Hospital mentioned above, and also the King Edward Medical College, Lahore, and the Medical School, Amritsar; in both of the last a system of co-education prevails, 10 seats in the former institution and 15 in the latter having, since 1929 and 1932 respectively, been reserved for lady students. In the year 1934 11 such students qualified for the M.B., B.S. degree of the Punjab university and 22 for the L.S.M.F. Diploma of the Punjab State Medical Faculty. Though the supply of lady doctors is still far short of requirements, it is now clear that ultimately the supply will be commensurate with the demand. It is also reassuring to learn that the number of qualified midwives shows a steady increase, the number of women who qualified in 1934 being 50 for the Diploma in Midwifery, 43 for the Nurse Dais Certificates, and 290 for the Indigenous Dais Certificates of the Punjab Central Midwives Board.

The increasing seriousness of the leprosy problem is becoming more evident, as a result of intensive surveys which have been made under the auspices of the Punjab Branch of the British Empire Leprosy Relief Association. This society employs a provincial leprosy officer, who is at present conducting a census of lepers throughout the province, and who has arranged for the establishment of clinics in various districts, and also for the training of doctors in anti-leprosy treatment. The 5 leper homes of the Punjab are maintained by missionary societies and are under the care of fully trained medical officers. At the end of the period under report, however, the American Presbyterian Mission expressed their inability to manage the Ambala Leper Home, which has been taken over by the Punjab Branch of the British Empire Relief Association. The Government makes a grant-in-aid towards the maintenance of the five leper homes, on a *per capita* basis for patients up to a fixed number. Accommodation, however, is becoming inadequate, partly as the result of 'burnt out', i.e., non-infectious cases remaining on at the homes, and partly owing to the number of lepers from places outside the Punjab. The Government considered the question of asking other administrations to contribute towards such lepers, but, as Punjab lepers are also accommodated in leper homes outside the Punjab, this was found to be impracticable. Government, however, is determined to organize a drive against leprosy, and has under consideration proposals for provincializing the post of leprosy officer, and for making special arrangements for 'burnt out' cases.

Another direction in which great progress was made during the triennium was in that of anti-rabic treatment. A very large number of patients attended the provincial bacteriological laboratory at Lahore, 4,760 being treated in 1933 and 4,392 in 1934, no death among all these cases being reported. The decrease in 1934 was due to the establishment of anti-rabic centres in 1934 at all district headquarters hospitals, doctors having been specially trained for the purpose; and in

the last five months of the year over a thousand patients were treated at such centres.

REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF BURMA FOR THE YEAR 1934

Cholera.—In his annual report for 1932, the Director of Public Health referring to the low figures for cholera in that year stated: 'The conditions favouring an outbreak are still generally present, and the influences which have limited the spread of this fatal disease may be removed at any moment'. The reduced incidence was unfortunately shortlived. It lasted throughout 1933, but in the autumn of 1934 the disease reappeared in epidemic form and continued with increasing severity up to the end of the year. Its appearance at this season of the year was quite unusual; a study of the seasonal distribution of cholera in Burma shows that its highest incidence has usually been in the months of April and May. Past epidemics have usually made their appearance in the spring.

Anti-cholera measures.—The public health staff in the affected districts was reinforced at an early date. Inoculation with anti-cholera vaccine was offered freely from the beginning. The public was sceptical at first, but intensive propaganda brought a better response. The villagers then began to recognize that the inoculated persons remained unattacked by the disease, and there were some dramatic instances of the only uninoculated member in a family dying of the disease while the rest of the family remained unattacked. The news of such happenings spread and helped to popularize inoculation and, as a result, a total of 96,224 persons had been inoculated by the 31st of December.

To purify the water in the creeks was of course out of the question, but wells and tanks were treated to as large an extent as possible with bleaching powder. The village conditions did not permit of segregation to any appreciable degree.

Smallpox.—The incidence of this disease was slightly in excess of the previous year's rate and of the five-year mean. As in 1933, the infection was widespread, only two districts being entirely free from the disease. The seasonal distribution of most of the cases was, as usual, from March to May, the lowest incidence being in October. More than half the cases (67.08 per cent) were among people over 10 years of age. It is reasonable to believe that many of these were vaccinated in childhood, and the figure shows how necessary it is in this province to get people revaccinated in order to keep up immunity against the disease.

Plague.—The rate is 0.11 higher than last year and 0.05 more than the five-year mean. As usual the seaboard districts remained free. The one death that occurred in Mergui district was imported from Moulmein by steamer, and was detected when the patient reached Victoria Point. Pyapon and Lower Chindwin districts reported no case. The remaining districts were all infected. The seasonal incidence was normal, the majority of cases occurring between December and March.

Anti-plague measures. (a) *Rat destruction.*—The total number of rats killed by trapping and smoking during the year was 802,185 compared with 724,165 in 1933. As in previous years, the large majority, viz, 734,689, were reported as killed in the Rangoon Corporation area.

It has long been felt that trapping and smoking of rats are not likely to bring about any appreciable reduction in the rat population of the province and in the incidence of plague. The success gained in the Madras Presidency, where the fumigation of rat burrows with cyanogas seemed to bring about a definite reduction in plague in Cumbum, encouraged this department to introduce this method of rat destruction in July 1934. A start was made in Mandalay, and the early success met with in that town resulted in a circular being issued to all health officers, asking that the cyanogas method of rat and rat-flea destruction should

be taken up. The response has been satisfactory, in so much that 44 municipalities and 19 district councils purchased the necessary apparatus with a supply of cyanogas. Municipal and rural health staff have been trained by officers of the public health department. This all took time and the use of cyanogas up to December 1934 cannot be described as general. In Mandalay, however, a well-organized campaign was kept up and is continuing throughout 1935, in the hope that the expected epidemic in the plague season of 1935-36 will be averted. By the end of 1934, four gangs were employed in this work in the plague-infected areas of Mandalay, and they were able to treat 43,500 rat holes in 5,920 premises. The co-operation of the inhabitants has been excellent and any opposition negligible.

Inoculation.—The total number of inoculations performed during the year was 103,667, an increase of 32,743 over the previous year. Of this year's total, 43,632 were done in the rural areas and 60,035 in towns. The response of the public to inoculation is improving, and its value as a protection against the disease is being recognized in a steadily increasing way.

Fevers.—There was an increase of 0.69 over 1933 and 0.89 over the five-year mean. Under the general heading 'fevers', 37.74 per cent of the total deaths in the province were recorded. A large proportion of these 'fevers' is undoubtedly malaria, and this is borne out by the fact that the highest number of deaths from 'fevers' was recorded in December, in which month the highest number of deaths from malaria was also reported.

Enteric fever.—The total number of deaths recorded is 267, which, it is considered, does not represent the true incidence of this type of fever. Bacteriological diagnosis is only resorted to by private practitioners in a small proportion of the cases of fever, and it is believed that a number of enteric infections are missed. The disease is notifiable in towns. Of the cases reported from Mandalay, 76 per cent had a fatal ending, which high figure suggests that many non-fatal cases probably went unreported.

Respiratory diseases.—This figure is 0.07 higher than last year and 0.06 over the five-year mean. The months of April to June show the lowest incidence for this group of diseases. Deaths were scattered fairly evenly throughout the rest of the year, with the highest figures in August and December. The higher mortality amongst males in the proportion of 135 : 100 was practically the same as in the previous year.

Beri-beri.—Only inadequate figures are available for this disease in the rural areas. Its prevalence is recognized in the Upper Chindwin, Mergui, Toungoo and Kyaukpyu district. In the Upper Chindwin and Toungoo, it is commonest amongst the mahouts of the timber camps. Its incidence is generally associated with cold and damp conditions, and the district health officer, Upper Chindwin, states that as soon as the cases are moved out of the camps and brought to Mawlaik hospital, they make a rapid recovery. The cold and damp conditions are probably only a contributory cause, and as far as can be ascertained the cases are due to vitamin B deficiency in deteriorated rice. In Mergui, the disease is practically confined to the Telugu coolies, who are reported to live on a low scale of diet. Few cases are noticed among the Burmans. In Kyaukpyu, it occurs in the Cheduba Island and to a lesser extent in Ramree Island. In the Southern Shan States, a few cases occurred in Loimwe and Kengtung towards the end of the monsoon, and are said to have been of a sporadic nature.

In the towns the rate shows an increase of 0.02 compared with last year but a decrease of 0.03 compared with the five-year mean. In Mergui, the Telugu coolies are said to have been the main sufferers, and in Moulmein this was also the case. In Syriam, 29 cases were admitted to the hospital of whom 7 died. Of these 16 were imported and 13 indigenous. Almost all were coolies who were unemployed, and in consequence ill-fed and undernourished.

Goitre.—The prevalence of this disease is mentioned in the annual reports from the Northern Shan States, Mogok and Toungoo district. In the Northern Shan States, it is found amongst the Palaungs and the Kachins living at comparatively high altitudes.

Yaws.—This disease is very prevalent in Mergui and Tavoy districts. In Mergui it is said to have been confined to Salons, Malayans and Siamese, but it is now spreading among Burmans and Karens who live in the interior of the district. It is regrettable that financial stringency made it impossible to continue the co-operation between the Mergui district council and the Deputy Commissioner's local fund, Tavoy, which, in the previous year, had enabled an effective treatment campaign to be carried out in the upper reaches of the Tenasserim river. In that year a sub-assistant surgeon had transversed the affected area and had treated over 500 cases. Similarly in Mandalay district, where a survey of yaws had been carried out, the district council was unable to provide funds for treatment. In the Upper Chindwin district, yaws is common in the old Maingkaing and Mingin townships, which are far away from hospital treatment. In Mogok subdivision, the villages of Letpangon, Sezingon and Zigon were infected, but the medical authorities found it difficult to induce the people to come for treatment. In Sagaing and Katha districts, in the Chin Hills and in the Lower Chindwin district, the disease is also reported to be fairly common.

Leprosy.—No new leprosy survey was carried out during the year, as it was considered better policy to consolidate the work in the Minbu and Meiktila districts which had been already surveyed. A special officer was stationed in each district for this purpose. The colony which had been opened in Minbu in December 1933 progressed on satisfactory lines, and at the end of the year 34 lepers were residing in it. Its initial expenses were defrayed by a grant of Rs. 500 from the Burma Branch of the British Empire Leprosy Relief Association, Rs. 350 from the district council, Rs. 100 from the municipality and Rs. 50 from the Deputy Commissioner's local fund. There is a demand for increased accommodation in the colony, and its year's work can certainly be regarded as satisfactory. There are two classes of patients in the colony, private and public. The private patients are given only free treatment and make their own arrangements for food. The expenditure on the public patients is met entirely from the special leprosy fund. The clinics in the towns in this district did not meet with the same success. The distances that people had to travel to get to the clinic made it difficult to increase the numbers.

In Meiktila district there were clinics in Meiktila itself, in Mahlaing, Wundwin and Thazi, and the special leprosy officer's work resulted in satisfactory attendances. The leprosy problem in this district is a very serious one. The figure given in the 1931 census for lepers in this area is 1.31 per 1,000, but a survey of 19,249 people showed that the true incidence is 16.57 per 1,000. If this survey ratio is taken as representative of the whole district, which has a population of 309,999, it means that there are over 5,000 lepers in Meiktila district alone. The need for a leper colony is very great and for that reason a local committee consisting of the leading persons in the district was formed in September 1934 to raise funds and to establish a colony. It is disappointing to record that up to now the difficulties of securing a site have not been solved. Suitable sites are available near Meiktila, but the prejudice, organized or otherwise, of the local villagers against the establishment of a leper colony near them has held matters up. The Burma Branch of the British Empire Leprosy Relief Association is ready to help the colony with a grant, and in fact has already handed over some money for the sinking of a well.

In Monywa, the excellent record of the leper colony, which was established there in 1927, has been maintained and at the end of the year there were 60 resident patients. In Kengtung in the Southern Shan States,

a colony is run by a Roman Catholic mission and at the end of the year 82 patients were living in it.

Veneral disease.—The venereal disease statistics of this department, relating only as they do to deaths, afford no criterion of the incidence of venereal disease in the province. Widely varying estimates have been made as to the degree to which it prevails. Hospital statistics afford little clue, as it is believed that only a small percentage seek treatment there, a large number being treated by quacks. The figures obtained from the post-mortem room of the Rangoon General Hospital show that out of 791 cases examined in 1934, 166 or 21 per cent showed pathological signs of syphilis. The superintendent of the Mandalay hospital sent regularly, from September 1933 onwards, specimens of placental blood taken in the labour room from apparently healthy patients. These were subjected to the Kahn test and 21.8 per cent were found positive. Similar examinations of placental blood from the Dufferin Hospital, Rangoon, revealed 3.1 per cent as positive to the Wassermann test.

Rabies.—The death rate was 0.02 which is the same as for both the previous year and the five-year mean. The number of persons treated for rabies during the year in all the treatment centres was 3,803, and the daily average attendance for treatment of rabies at the Pasteur Institute, Rangoon, was 74, compared with 64 in the previous year.

During the year by-laws for the keeping of dogs and the destruction of stray dogs within municipal limits were passed by the Henzada, Pyinmana, Kyonpyaw and Bhamo municipalities.

Conservancy.—The campaign to introduce bored-hole latrines in the rural areas continued throughout the year. In Akyab, Henzada, Myaungmya and Pyapon districts this type of latrine was installed in varying numbers. Where the latrine was properly cared for it has been successful, but in a number of cases its efficiency has been destroyed through the negligence of the inhabitants. From reading the annual reports from districts in 1934, the impression is gained that there is some slight movement in the state of apathy that has characterized the villager regarding his environment. There is a long road to travel before a really appreciable improvement can be brought about. The tying of cattle under houses, the non-removal of rubbish and crowding, the lack of proper latrines are big obstacles to obtaining anything like clean villages. The youths improvement society, a new body of young men pledged to raise the standard of rural sanitation, has made a start by visiting villages and preaching the benefits of good sanitation, in some cases giving demonstrations of the benefit of the bored-hole latrine. If the society continues its work on the right lines, it is reasonable to hope for an appreciable effect in the areas in which they work.

Rural Health Unit, Hlegu.—The health unit, in its fifth year of existence, had a very satisfactory record of work. Each year since the unit was started in 1930 has witnessed the introduction of some additional type of activity and improvement, and the standard of public health administration which has now been reached in the Hlegu township is a satisfactory one. The early period of scepticism and doubt on the part of the inhabitants has been left behind, and the unit is now firmly established, conferring real benefit on the people whom it serves and standing for the rest of the province as an example of progressive rural health work carried out on sound lines.

The unit has met with exceptional success in the matter of elucidating accurate vital statistics, which are necessary if the magnitude of the problems and the results of remediable measures are to be properly assessed. The efficient registration introduced by the unit has revealed the rather startling fact that the ratios of births and deaths in the township, for the five years previous to the inception of the unit, were in error to the extent of 122.53 per cent in the case of births, and 76.18 per cent in the case of deaths. The Hlegu figures can now be considered accurate, and

inadequate information received regarding patients treated at the centres.

Anti-rabic treatment is now so well established and, except for rare cases, apparently so free from risk of accident, that it is open to question whether, save as a means of collecting accurate data regarding the treatment, the *raison d'être* of authorized treatment centres has not largely disappeared. The compilation of reliable statistics relating to anti-rabic treatment is, however, undoubtedly of great importance, as part of the constant work which is going on all over the world towards improved methods of treatment, and it is particularly from the institutes in India, where such large numbers of cases are dealt with, that valuable information can be obtained.

A memorandum of instructions regarding anti-rabic treatment is shortly to be issued and it is hoped that this will help medical officers in charge of treatment centres in dealing with persons applying to them for anti-rabic treatment and in recording the necessary data, but no written instructions can replace practical training.

It is therefore strongly recommended that Government should take the necessary steps to ensure that all medical officers in charge of authorized treatment centres have received sufficient training in anti-rabic methods to enable them to carry out satisfactorily the special duties of their charge.

In default of such training it is the writer's opinion that the policy of restricting anti-rabic treatment to authorized centres might well be reconsidered and the collection of data of doubtful value be subordinated to the primary need for securing the early treatment of every person at risk.

Bacteriophage.—The demand for this product has steadily risen since its preparation was undertaken at this institute. During 1934, 871,316 doses were issued, which is 164,152 doses more than in 1933. Of this amount 652,960 doses, or 222,080 more than last year, were supplied free by Government to the bacteriophage controlled areas of Nowgong and Habiganj: 41,312 doses were supplied to other Government institutions in the province, 87,920 to tea gardens, 1,342 to missions, 3,712 to railways, 35,510 to other private institutions, 832 to municipalities, 29,424 to local boards and 18,304 to other Governments.

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The staff of the malaria section numbered 58, of which 17 are qualified medical men with special training in malariology; 9 being sub-assistant surgeons, public health department, deputed for a full year's training in the laboratory and in the field.

One member of the staff took the course in malariology at Karnal during the year.

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A study of the periodicity of malaria factors in Assam was undertaken. From dissections of mosquitoes this year we have still further confirmed previous work showing *A. minimus* to be the significant vector in the Brahmaputra Valley of Assam. We have determined that there are areas of non-endemicity and areas of varying degrees of endemicity in which the transition of intensity from a low to a high degree may be either abrupt or gradual. We have studied the reasons for this differing intensity and have shown that the differences in water conditions are solely

responsible. From these studies we have determined that under certain conditions where there is no significant extension of breeding to other than perennial streams, malaria may be reduced by the introduction of cold weather and pre-monsoon antilarval activities and that, under these conditions, antilarval work undertaken in the monsoon season is not justified and is uneconomical. In such areas, which we suspect to be the predominating type in Assam, the cost of antilarval operations can be reduced enormously by these findings. In other areas where breeding is carried over from the perennial streams to *bhils*, swamps and clear running drains during the monsoon season, antilarval activities will have to be continued for a longer period and by different methods. Such areas are in the minority.

Bacteriophage enquiry under the Indian Research Fund Association

On the whole, the cholera history of Assam during the year 1934, analysed as it necessarily has been on somewhat speculative grounds, cannot be said to lead to any definite conclusions either for or against the value of bacteriophage when used alone on a large scale as a preventive of cholera, and the whole question, so far as this year's results go, must still be regarded as *sub judice*.

[*Basic research.*—A great deal of work under this heading has been carried out and this section of the report will be found of considerable interest to specialists.]

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HEAT STROKE AND CARBON DIOXIDE

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In a paper read to the Indian Science Congress at Indore, Dr. Mathur of this laboratory related experiments which may have an important bearing on the practical treatment of heat stroke.

He induced heat stroke artificially in anaesthetized cats and found that, after a period of shallow and rapid respirations, there was a sudden failure of the respiratory centre. He next attempted to revive these animals

serve as a standard against which the corresponding rates of other rural areas in the province can be measured. In 1934, the birth rate was 34.23, the death rate 21.21 and the infant mortality rate 189.21.

Equally effective has been the success of the unit in improving environmental sanitation, especially in the all-important matter of conservancy. In 17 villages in the township, a total of 1,527 bored-hole latrines has been installed. At first these were supplied free, and the villagers would probably not have accepted them otherwise. A contribution towards their construction in whole or in part is now asked for according to the means of the householder, while for those who are unable to afford any payment the latrine is still provided free. Payment in all cases is made direct to the contractor by the individual, and the unit does not enter into any part of the transaction except to keep a record of the number of people making such payments.

Malaria.—This disease is the principal cause of ill-health and mortality in rural areas. Infection is widespread in certain parts, and the importance of the problem is only equalled by the difficulty of finding a practical solution which will bring about a permanent reduction in the disease. In addition to the deaths caused by malaria either directly or indirectly, the amount of inefficiency that the disease gives rise to is very great. Any big schemes of mosquito eradication by drainage and reclamation are not a practical proposition. The issue of cinchona febrifuge tablets is for the moment our most effective weapon amongst the villagers. If the villager learns the use of quinine, he will be able to reduce the length and the frequency of his fever periods, and thereby lose less in physical strength until, as happens in many cases, he develops an immunity at any rate to the local strain of infection. This policy of issuing cinchona febrifuge tablets was followed out during the year by this department as far as financial circumstances permitted. Free issues were made whenever local authorities applied for them, the governing condition being that the people were too poor to pay for it themselves.

Education in the matter of malaria treatment is very necessary amongst the rural population. In recent years the quack doctors (*sesayas*) in the country districts have spread a belief among the people that they are being attacked by a new disease which they have named *Metkalaung*. This belief started in the Shan States and has now spread as far as the districts of Shwebo and Amherst. An investigation into what were stated to be cases of *Metkalaung* showed that they were cases of fever, almost invariably malaria. The *sesayas* tell the people that the physical signs are the presence of pimples inside the anal opening, and the common treatment is to prick the so-called pimples with a needle or a thorn. The investigation made by this department has shown that the pimples exist only in the imagination of the *sesayas*.

To meet this spreading heresy, this department has prepared a pamphlet in Burmese which will be issued widely to counteract the harmful propaganda of the *sesayas*.

Cinchona febrifuge tablets.—The Rangoon Jail continued to manufacture these tablets. The number of tablets sold during the year through the treasuries was 3,371,580 or an increase of 618,780 tablets on the sales of 1933. An increase in sales was noticed in 23 districts.

A total of 208,980 tablets was distributed free in 12 districts compared with 336,600 tablets in the previous year.

The average consumption of cinchona febrifuge per head of population, owing to considerable increase of sales in several districts, rose from 0.87 grain in 1933 to 1.00 grain in the year under review.

Maternity and child welfare

Maternity work.—Public maternity work in Burma is undertaken either by midwives who are the employees of voluntary child welfare societies, or by midwives engaged by local bodies. The first of these

two groups of midwives come under the public health department for supervision, while those employed by the local bodies are under the control of the medical department. In other provinces, normal maternity work outside hospitals is tending to be regarded more as the function of the public health department than that of the medical department. The possibility of modifying our provincial organization on these lines has been considered, but the limited staff of this department is insufficient to exercise adequate and efficient control. For the present, therefore, matters must remain as they are.

Child-welfare work.—The only child-welfare work in the province carried on under official auspices is that conducted in Rangoon by the corporation and in Hlegu by the rural health unit. Otherwise this important subject is dealt with by voluntary child-welfare societies.

Health education.—During the year the extent of the propaganda work carried out by this department increased appreciably. There was an increased demand from local authorities, associations and individuals for publications and pamphlets, and also for the services of the hygiene publicity officer.

EIGHTEENTH ANNUAL REPORT OF THE KING EDWARD VII MEMORIAL PASTEUR INSTITUTE AND MEDICAL RESEARCH INSTITUTE, SHILLONG, FOR THE YEAR ENDING 31ST DECEMBER, 1934

Anti-rabic section.—The scheme of treatment introduced last year was continued in 1934. Throughout the year the vaccine consisted of a 5 per cent emulsion of carbolized, killed, sheep fixed virus. The classification of the cases and the dosage remained unchanged, namely, class I cases, 2 c.cm. daily for 14 days; classes II and III, 4 c.cm. daily for 14 days; class IV, 6 c.cm. daily for 14 days.

To conform with the practice of other Pasteur institutes in India, the cases treated in this institute are shown separately in the statistical tables.

No accidents following treatment were reported and the higher percentage of fixed virus now given almost universally in India appears to be no more apt to be followed by ill-effects than the 1 per cent vaccine formerly used.

Though it is perhaps rather early to attempt to assess the value of the stronger 5 per cent vaccine, yet since this vaccine was introduced into this institute and the principle of dosage graduated according to risk adopted, there appears to have been a significant fall both in the actual number of deaths from hydrophobia and in the case mortality. It is for consideration whether the use of still higher doses such as are now safely used for patients at greatest risk in most of the institutes in India would not result in a still greater saving of life.

The principle of decentralization of treatment, urged on all institutes by the Research Workers' Conference, has been fully accepted in this province. During 1934 four new treatment centres were opened, one, a Government centre, and three private centres. One private centre was closed as being no longer required. The total number of anti-rabic centres now open for treatment in Assam is fifty-seven.

The filling up of the case cards by medical officers in charge of treatment centres is far from satisfactory and the statistics compiled therefrom are consequently of very doubtful value. The necessity for the compilation of accurate statistics of treatment in the Pasteur institutes of India has frequently been stressed by the rabies sub-committee of the Research Workers' Conference who partly with this end in view have repeatedly urged that anti-rabic centres should only be opened in charge of medical officers who have undergone training in anti-rabic methods. This recommendation, unfortunately, has not been followed in this province, and the result is reflected—through no fault of the medical officers concerned—in the unsatisfactory and often

inadequate information received regarding patients treated at the centres.

Anti-rabic treatment is now so well established and, except for rare cases, apparently so free from risk of accident, that it is open to question whether, save as a means of collecting accurate data regarding the treatment, the *raison d'être* of authorized treatment centres has not largely disappeared. The compilation of reliable statistics relating to anti-rabic treatment is, however, undoubtedly of great importance, as part of the constant work which is going on all over the world towards improved methods of treatment, and it is particularly from the institutes in India, where such large numbers of cases are dealt with, that valuable information can be obtained.

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SIR,—In a paper read to the Indian Science Congress at Indore, Dr. Mathur of this laboratory related experiments which may have an important bearing on the practical treatment of heat stroke.

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by performing artificial respiration in the usual way, but without success. They did revive, however, if the CO₂-content of the air sent into the lungs was markedly increased.

The time is now approaching for equipping heat-stroke treatment centres in India. I would suggest therefore that a CO₂-cylinder should be made part of the regular equipment of these centres, and that all patients should be given this gas to inhale in due dilution.

Yours, etc.,

W. BURRIDGE, D.M., M.A. (Oxon.),
Professor of Physiology,
Lucknow University.

LUCKNOW,
20th March, 1936.

A PRACTICAL WAY OF DEALING WITH *Aedes Aegypti* (*Stegomyia fasciata*) MOSQUITO BREEDING IN COUNTRY CRAFT

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In this year's February number of your esteemed *Indian Medical Gazette*, you were good enough to publish an article of mine entitled 'A practical way of dealing with *Aedes aegypti* (*Stegomyia fasciata*) mosquito breeding in country craft'. The work done for

I have to thank Drs. Maplestone and Strickland for giving me useful hints and help in this connection ever since I started the work.

Yours, etc.,

F. D. BANA, M.B., M.R.C.S., D.P.H.,
D.T.M. & H., J.P.
Administrative Medical Officer.

BOMBAY PORT TRUST,
BALLARD ROAD, FORT,
BOMBAY,
12th March, 1936.

INFECTION WITH *BERTIELLA STUDERI*

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the February number of the *Gazette* (p. 81) Major Riddle and I reported a case of infection with *Bertiella studeri* in a boy. Only part of the worm was recovered as a result of treatment, and Major Riddle has since informed me that about two months after the first treatment the boy began to pass segments again and he passed four worms, three of them with heads, after a dose of ext. filix mas. These are all identifiable as *B. studeri*. As far as I am aware

Date	(1) Country craft examined	(2) Country craft found breeding	Per- centage of (1)	(3) Country craft emptied out	Per- centage of (2)	(4) Refused examination	Per- centage of (1)	(5) Refused emptying out	Per- centage of (1)
From									
25-2-35 to 13-4-35.	898	458	51	385	87	31	3.4	69	7.6
15-4-35 to 11-5-35.	1,170	543	46	518	95	31	2.6	29	2.4
13-5-35 to 11-6-35.	1,481	666	44	660	99	2	0.1	26	1.7
12-6-35 to 13-7-35.	1,204	491	40	486	98	4	0.3	5	0.4
15-7-35 to 17-8-35.	575	231	40	231	100	0	0.1	0	0.1
19-8-35 to 21-9-35.	693	195	28	194	99	0	0.1	1	0.1
23-9-35 to 26-10-35.	2,574	363	14	360	99	0	0.03	3	0.1
27-10-35 to 30-11-35.	1,855	680	36	659	96	1	0.05	1	0.05
1-12-35 to 31-12-35.	1,539	453	29	453	100	1	0.06	0	0.06
1-1-36 to 31-1-36.	2,349	525	22	525	100	1	0.04	0	0.04
1-2-36 to 29-2-36.	2,480	469	14	466	99	0	0.04	3	0.1
TOTAL ..	16,818	5,074	30.17	4,937	97.29	71	0.42	137	0.81

the Port of Bombay then having been found useful was extended and is being continued with very gratifying results in as much as the percentage of breeding found up to 15th April, 1935, amounting to 51 per cent, has steadily diminished to close on 30 per cent after a year's working as can be seen from the following figures of monthly examinations up to the end of February 1936. They also show relative percentage of 'emptying out' as steadily rising with diminishing returns for refused examinations and refused emptying outs as 0.42 per cent and 0.8 per cent respectively.

This has been achieved by simple persuasive methods and I am glad to let you know that the Government of Bombay are considering with the local authority (Port Trust) an enactment of a draft rule to legalize the procedure.

this is the first multiple infection with this worm to be recorded.

I also wish to note that this case, which we claimed as the tenth known human infection, is really the eleventh as I have found that C. Africa and E. V. Garcia reported a case in a child in the Philippines in January 1935. (*Philippine Journ. Sci.*, Vol. 56, p. 1.)

Yours, etc.,

PHILIP A. MAPLESTONE, D.S.O., D.S.C.,
M.B., Ch.B., D.T.M.

THE HELMINTHOLOGY RESEARCH LABORATORY,
SCHOOL OF TROPICAL MEDICINE,
CALCUTTA,
30th March, 1936.

Service Notes

APPOINTMENTS AND TRANSFERS

THE services of Captain S. M. K. Mallick are placed at the disposal of the Government of the Punjab, with effect from the 22nd February, 1936 (afternoon), for appointment as Principal, Medical School, Amritsar.

Captain A. K. Gupta, on general duty at the Medical College Hospitals, Calcutta, is appointed as Civil Surgeon, Rajshahi, *vice* Captain F. H. A. L. Davidson, granted leave.

Captain H. S. Waters, Presidency Surgeon, J. J. Hospital, Bombay, is appointed to be Honorary Surgeon, St. George's Hospital, Bombay, in addition to his own duties.

The services of Captain A. K. Gupta and Captain B. N. Hazra are placed temporarily at the disposal of the Government of Bengal, with effect from the 25th December, 1935.

Captain M. K. Afridi is appointed to the Medical Research Department on probation for 2 years, and is placed on foreign service under the Indian Research Fund Association, with effect from the 4th January, 1936.

Captain B. F. B. Russell is appointed to officiate as Executive Officer, Saugor Cantonment, in addition to his ordinary duties, *vice* Lieutenant Deman Sing Negi, proceeded on leave. Dated 3rd March, 1936.

In supersession of previous Notification, the services of Captain B. Temple-Raston are placed temporarily at the disposal of the Government of the Punjab, with effect from the 12th March, 1935.

The Viceroy and Governor-General has been pleased to make the following appointment on His Excellency's personal staff:—

To be Honorary Surgeon

Colonel A. A. McNeight, *vice* Colonel W. T. McCowen, retired. Dated 3rd March, 1936.

Brevet-Colonel H. H. Thorburn, C.I.E., Officiating Inspector-General of Civil Hospitals and Prisons, and Director of Public Health, North-West Frontier Province, is confirmed in that appointment, with effect from the 4th March, 1936.

Lieutenant-Colonel B. Z. Shah, Superintendent of Mahableshwar, on the close of Mahableshwar season, is appointed to be Officiating Civil Surgeon, Ahmedabad, with attached duties.

Lieutenant-Colonel Jelal M. Shah, M.B.E., Specialist in Venereal Diseases for the Presidency of Bombay, is appointed to be Honorary Venereologist, St. George's Hospital, Bombay, in addition to his own duties, *vice* Mr. W. H. Hickey.

On reversion from foreign service under the Indian Research Fund Association, Major H. W. Mulligan is appointed as Officiating Assistant Director of Central Research Institute, Kasauli, with effect from the date on which he assumes charge of his duties, *vice* Lieutenant-Colonel W. J. Webster, granted leave.

Major T. H. Thomas, Civil Surgeon, Darjeeling, on relief, is appointed to act as Surgeon Superintendent, Presidency General Hospital, Calcutta, during the absence, on leave, of Lieutenant-Colonel H. E. Murray, or until further orders.

Major J. C. Drummond, Civil Surgeon, Hooghly, on relief, is appointed as Civil Surgeon, Darjeeling, *vice* Major T. H. Thomas.

Captain C. J. H. Brink is appointed as Air Port Health Officer, Karachi, with effect from the 23rd December, 1935, and until further orders.

LEAVE

Lieutenant-Colonel W. J. Webster, M.C., Officiating Assistant Director, Central Research Institute, Kasauli, is granted leave on average pay for 8 months, with effect from the 1st March, 1936, or date of availing.

Lieutenant-Colonel E. W. O'G. Kirwan, Professor of Ophthalmic Surgery, Medical College, Calcutta, and Ophthalmic Surgeon, Medical College Hospitals, is allowed leave for 8 months, with effect from the 2nd April, 1936, or from any subsequent date on which he avails himself of the leave.

Lieutenant-Colonel H. E. Murray, Surgeon Superintendent, Presidency General Hospital, Calcutta, is granted leave on average pay for 3 months and in continuation leave on half-average pay for 4 months, with effect from the 17th April, 1936, or from any subsequent date on which he avails himself of the leave.

Lieutenant-Colonel W. Ross Stewart, C.I.E., Surgeon to His Excellency the Viceroy, is granted leave on average pay for 2 months and 15 days, with effect from the 19th April, 1936, or date of availing. On the expiry of this leave his services will be placed at the disposal of the Defence Department.

Lieutenant-Colonel A. H. Harty, Civil Surgeon, Ahmedabad, is granted leave on average pay for 4 months and 10 days followed by such leave on half-average pay as will bring the total period of leave to 6 months, with effect from the 25th April, 1936.

Captain F. H. A. L. Davidson, Civil Surgeon, Rajshahi, is granted leave for 4 months, with effect from the 8th April, 1936.

PROMOTIONS

Lieutenant-Colonel to be Colonel

W. E. R. Williams, O.B.E. Dated the 29th January, 1936, with seniority from 2nd February, 1931.

Majors to be Lieutenant-Colonels

W. E. R. Dimond. Dated 26th January, 1936.

A. C. Craighead. Dated the 9th February, 1936.

P. H. S. Smith. Dated 29th February, 1936.

H. J. H. Symons, M.C. Dated 29th February, 1936.

The provisional promotions to the rank of Major of the undermentioned officers are confirmed:—

M. S. Gupta.

R. Linton.

H. W. Mulligan.

Captains to be Majors

M. K. Afridi. Dated 1st February, 1936.

G. S. Chawla. Dated 9th February, 1936.

Lieutenant (on probation) to be Captain (on probation)

J. F. A. Forster. Dated 5th January, 1936, with seniority 24th June, 1935.

To be Lieutenants (on probation)

Willie McNeill Niblock, with seniority 27th December, 1934.

Hector James Gibson, with seniority 27th December, 1934.

Philip Arthur Hubbard.

Timothy Philip Mulcahy.

Francis Eugene McLaughlin.

Edwin Herbert Wallace.

Sidney Ward Allinson. Dated 13th January, 1936, with seniority 13th January, 1935.

To be Lieutenants (temporary commissions)

Harbans L. Khosla. Dated 11th February, 1935.

Nisar Mohammad Durrani. Dated 16th February, 1935.

Suraj Prakash Wanchoo. Dated 22nd February, 1935.

Sharad Chandra Misra. Dated 28th February, 1935.

Shri Rameshwar. Dated 5th March, 1935.

RETIREMENTS

Colonel W. T. McCowen, V.H.S. Dated 29th January, 1936.

Lieutenant-Colonel W. D. Keyworth. Dated 31st January, 1936.

Notes

SALICIN

THE history of medicine provides many examples of therapeutic agents which have suffered a partial or complete eclipse, after enjoying a wide vogue. To a certain extent this has happened to Salicin, a fate quite unmerited by its outstanding therapeutic merit.

Introduced originally by MacLagan in 1874 as an anti-rheumatic, it proved strikingly successful both in acute rheumatism and in influenza. The introduction of sodium salicylate and allied compounds, however, on account of their cheaper cost, somewhat checked its great popularity. Yet many practitioners have remained faithful to Salicin, being convinced of its superior therapeutic properties.

Salicin is a crystalline glucoside obtained from the bark of various species of willow and poplar. No proprietary claims are vested in Salicin which is a British Pharmacopœia product conforming to the official standards.

Advantages over salicylate compounds.—While possessing all the desirable therapeutic properties of salicylic acid compounds, Salicin is free from many of their undesirable by-effects. Even in large doses it does not produce the depressing effects on the heart, respiration and central nervous system so commonly associated with the former. Properly diluted it is free from irritant action on the stomach. Its bitter taste is much less nauseous than the sweetish flavour of sodium salicylate.

Salicin in influenza.—Wide clinical experience has consistently proved it to be so effective in this malady, as to justify the term 'specific'. Given both to sufferers and contacts it definitely limits the spread of infection. In a typical case its prompt use at once controls symptoms of pain and discomfort and reduces the temperature, thus arresting the attack. It also stops development of those respiratory and other complications which render influenza such a deadly disease. Thus, in an analysis of over 3,000 cases treated with Salicin, one observer demonstrated that it entirely prevented such sequelæ and in no case was there a fatal termination. In contrast to salicylate compounds, salicin does not aggravate the depressing effect on the nervous system so commonly occurring during convalescence.

Salicin can be used for patients of all ages and all types. The 3,000 cases reported on have ranged in age from 3 to 77 years. Whether young or old, recovery was equally rapid.

Administration and dosage.—Most authorities favour intensive dosage with Salicin at the earliest possible moment after diagnosis. Adults should receive 20 grains each hour for the first twelve hours; thereafter 20 grains every two hours for a further twelve hours. In the case of children, the optimum dosage appears to be 1 grain for each year of age given every hour for twelve hours and afterwards every two hours. Such heroic dosage is found to be well tolerated by all types of patients and to produce rapid control of the disease.

In skin affections.—Salicin has proved a really useful agent in an entirely different field of medicine, namely in dermatology. It was recommended originally in psoriasis, and prolonged clinical trial has shown that it possesses a very definite value in this disorder, often proving successful where arsenic has failed to give relief. The best results are obtained in acute and rapidly spreading cases. Similar good effects are obtained in many instances of lichen planus, pityriasis rosea in bullous eruptions and in hyperæmic forms of lupus erythematosus. The usual dosage in such cases is 15 grains three times a day after food, gradually increased to 20 to 25 grains, and supported by suitable local treatment.

'TABLOID' BLAUD PILL AND COPPER

THE administration of iron in one of its various forms is a therapeutic measure of long tradition, but recently it has been suggested that the therapeutic action of the iron is enhanced by the addition of minute quantities of copper. Further, it is claimed that, as copper appears to be necessary for the synthesis of hæmoglobin, iron is only fully utilized when small traces of copper are present, and that the beneficial action of iron preparations is due to the presence of traces of copper either in the product or in the patient's food. For those physicians, therefore, who favour the addition of copper to iron, Burroughs Wellcome and Company are now issuing 'Tabloid' Blaud pill and copper in bottles of 100. Each product contains Blaud pill gr. 10 and copper sulphate gr. 1/100.

CORPUS LUTEUM HORMONE

HITHERTO the high price for corpus luteum hormone preparations has led to anterior lobe preparations and extracts of equal value being tried first (*Ars Medici*, December 1935, page 541).

In this connection Messrs. Schering-Kahlbaum A.G., Berlin, have been able, on account of a new process of manufacture, to reduce the price of their corpus luteum hormone preparation—Proluton—to a considerable extent.

The Standardization Commission of the Hygiene Committee of the League of Nations in July 1935, in London, created a new unit for corpus luteum hormones and termed it the 'international unit'. One milligramme of purest progesteron (corpus luteum hormone) has been determined as one international unit.

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Original Articles

A COMPARATIVE STUDY OF THE ACTION OF ATEBRIN AND ATEBRIN-PLASMOCHIN COMBINATION ON INDIAN STRAINS OF MALARIA

By R. N. CHOPRA, C.I.E., K.H.P., M.A., M.D. (Cantab.),
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

J. C. GUPTA, M.B.

and

B. SEN, B.Sc., M.B.

(From the Department of Pharmacology, School of Tropical Medicine, Calcutta)

DURING the last decade a number of compounds have been synthesized for the treatment of malaria and of these, plasmochin and atebriin have proved to be the most effective and are being extensively used. The main action of plasmochin is on the sexual forms of *P. falciparum* while atebriin, like the cinchona alkaloids, acts on the asexual forms of *P. falciparum* and on both sexual and asexual forms of *P. vivax* and *P. malariae*. In the case of Indian strains the quantity of plasmochin, necessary to remove the crescents effectively, has been worked out to be 0.04 gm. to 0.06 gm. distributed over a period of two to three days while the usual effective dose of atebriin is 0.1 gm. three times a day for five consecutive days. Although the production of these synthetic remedies is a distinct advance in the therapy of malaria, the problem of prevention of relapses still remains unsolved.

The action of plasmochin has been fully investigated by various workers and although the drug has been shown to act chiefly on the sexual phase of the malarial parasites, a strong belief still exists in some quarters, that plasmochin has marked curative properties in the same way as atebriin or the cinchona alkaloids, and that it is even effective in preventing relapses. Green, Freiman and Stern (1929) have treated malaria with plasmochin alone, but our experience with Indian strains is that the dosage required to produce any obvious effects is likely to produce marked toxic symptoms.

In the attempt to effect a permanent cure for malaria, the medical profession in this country have been using plasmochin combined with either quinine or atebriin. Tablets containing these combinations in various proportions have been put on the market by reliable firms, as there is a great demand for them in various parts of the world. Certain advantages are claimed for these combinations, for example in malignant tertian infection by acting on the gametocytes they are said to shorten the duration of treatment and reduce to a considerable extent the chances of transmission of malaria

to others. Often plasmochin has been used in large doses and for prolonged periods in these combinations and toxic symptoms have resulted in the form of epigastric pain, cyanosis, cardiac arrhythmia, yellow coloration of the body, etc.

A study of the reports of different workers leaves no room for doubt as to which drug is responsible for the production of the toxic effects. Plasmochin has been unanimously declared a toxic drug and its administration in large doses and for prolonged periods has undoubtedly produced severe toxic effects. Occasionally even small doses are liable to produce gastric pain or cyanosis or both. Chopra and Chaudhuri (1935) have quoted cases showing the possibility of the toxicity of plasmochin being enhanced by its combination with atebriin.

The view that plasmochin acts also on the asexual stages of malarial parasites and that its combination with atebriin may increase the activity of the latter drug in preventing relapses, was utilized by Messrs. Bayer-Meister Lucius in preparing the atebriin-plasmochin dragées each of which contains 0.1 gm. of atebriin and 0.0033 gm. of plasmochin. The idea underlying this combination is to obtain the effects with minimum doses of plasmochin in order to avoid the production of toxic symptoms. The dose of plasmochin has been kept within safe limits so that, even if it fails to produce any reduction in the relapse rate, it will carry on its crescenticidal action without causing undesirable symptoms. These dragées are coated in such a way that they are not acted upon by the gastric juice and disintegration usually occurs lower down in the intestine. In this paper we have given the result of a preliminary investigation regarding the effect of these atebriin-plasmochin dragées on Indian strains of malaria as compared with atebriin by itself. The studies in connection with this combination were carried out to determine the effects :

(1) on the sexual and asexual forms of the parasites and the time taken for their complete disappearance from the peripheral blood,

(2) on the relapses,

(3) on the splenic enlargement,

(4) on the function of liver, and

(5) to note any untoward symptoms produced by this combination.

The dragées were tried on a series of 54 cases in the Carmichael Hospital for Tropical Diseases and the effects were compared with those obtained on a previous series of cases treated with atebriin alone. Patients suffering from malaria were admitted under the senior author and a thorough physical examination was conducted immediately after admission. Thin and thick blood films were carefully examined and in some cases a rough estimate of the number of malarial parasites per c.mm. was also made. Except in urgent cases, the anti-malarial treatment was not commenced until the parasites were properly identified and the parasitic

counts were fairly constant for two or three consecutive days. Daily examination of blood during this period enabled us to watch the progress of the cases and gave us information regarding the intensity of the infection. If the parasites in the peripheral blood were scanty, these were allowed to increase till the counts were fairly high and the rigor and other symptoms were fairly pronounced. Whenever possible, sugar tolerance and van den Bergh's tests were performed both before and after the course of treatment, in order to find out if atabrin and plasmochin, when given in combination, produce any damaging effect on the function of the liver.

When all these preliminary investigations were completed the drug was given by the mouth, one dragée (containing 0.1 gm. of atabrin and 0.0033 gm. of plasmochin) three times a day for five consecutive days being the usual

dose for an adult. No other drug was given except a light purgative whenever necessary. As regards diet, only the usual restrictions for a febrile condition were observed. During the course of treatment daily examination of the blood was carried out and, whenever possible, a rough estimate was also made of the number of parasites per c.mm. of blood.

After the completion of the treatment, the patients were carefully observed in the hospital for at least a fortnight and daily examinations of blood for malarial parasites were conducted during this period. If thick and thin films showed no parasites, cultural examinations of the blood were finally made before the patients were discharged. If routine laboratory examinations revealed any other infection, e.g., dysentery, helminthiasis, etc., these were treated during the period of observation.

TABLE I

The relationship between the percentage of cases and the number of days required for complete disappearance of parasites from the peripheral blood after the commencement of the treatment.

Species of parasites	COMPLETE DISAPPEARANCE OF PARASITES FROM PERIPHERAL BLOOD										REMARKS		
	Number of cases studied		On the 3rd day in percentage of cases studied		On the 4th day in percentage of cases studied		On the 5th day in percentage of cases studied		On the 6th day in percentage of cases studied			In more than 6 days in percentage of cases studied	
B. T. ..	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A	In one case the parasites were found in the peripheral blood even on the 8th day after commencement of treatment.
M. T. ..	20	11	28.5	54.6	42.9	36.4	19.0	9.0	4.8	..	4.8	..	
Quartan ..	19	18	31.9	11.1	18.2	33.3	13.6	11.1	22.8	..	9.1	44.4	
	4	5	..	20.0	..	80.0	50.0	..	..	..	50.0	..	
Mixed B. T. and M. T.	7	3	..	..	57.3	33.3	14.2	..	14.2	..	14.2	66.6	In one case B. T. disappeared on the 8th day. Recurrence of the same infection one month after the course of treatment.

A = Atebrin.

P = Plasmochin.

TABLE II

The comparative efficacy of the drug on sexual and asexual forms of different species

Species of parasites	SEXUAL FORMS						ASEXUAL FORMS					
	Number of cases where present		Percentage of cases where they disappeared within 4 days		Percentage of cases where they disappeared in more than 4 days		Number of cases where present		Percentage of cases where they disappeared in 4 days		Percentage of cases where they disappeared in more than 4 days	
B.T. ..	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A	A + P	A
M.T. ..	10	7	90.0	100.0	10.0	..	19	11	70.0	100.0	30.0	..
Quartan ..	12	9	41.7	11.2	49.5	88.8	19	18	52.6	100.0	47.4	..
	3	4	33.3	100.0	66.6	..	4	5	0.0	100.0	100.0	..

A = Atebrin.

P = Plasmochin.

TABLE III

The relationship between the parasite count and the number of days required for disappearance of parasites

Species	WITH A + P		WITH A	
	Parasite count on the day of commencement of treatment	Number of days required for complete disappearance of parasites from peripheral blood	Parasite count on the day of commencement of treatment	Number of days required for complete disappearance of parasites from peripheral blood
B. T. ..	(1) 12,600	3 days	(1) 10,020	4 days
	(2) 22,000	2 "	(2) 16,820	3 "
	(3) 18,000	2 "	(3) 30,000	2 "
	(4) 7,500	3 "	(4) 28,000	1 day
	(5) 8,500	2 "	(5) 21,400	3 days
	(6) 4,720	5 "	(6) 9,840	2 "
M. T. ..			(7) 10,000	3 "
	(1) 7,000	4 days	(1) 9,240	more than 6 days
	(2) 15,400	2 "	(2) 3,840	" " 6 "
	(3) 920	3 "	(3) 14,200	only " 4 "
	(4) 3,500	2 "	(4) 128,000	more than 6 "
Quartan ..	(5) 880	5 "	(5) 13,000	6 "
	(1) 560	8 days	(1) 3,520	3 days
	(2) 950	4 "	(2) 1,000	3 "
			(3) 800	2 "
			(4) 2,400	3 "

TABLE IV

The function of liver before and after treatment

No.	Species	Liver function test before treatment	Liver function test after treatment
1	B. T.	Slightly defective	Not done.
2	B. T.	Normal	Normal.
3	M. T.	Slightly defective	Not done.
4	M. T.	Normal	Normal.
5	M. T.		
6	B. T.	Doubtful	Not done.
7	M. T.		
8	B. T.	Normal	Slightly defective
9	Quartan	"	"
10	M. T.		Not done.
11	Quartan	Doubtful	" "
12	M. T.	Normal	" "
13	M. T.	"	" "
14	M. T.	Defective	Normal.
	B. T.		Defective.

Results and discussion

Chopra, Das Gupta and Sen (1933) have studied the effects of atebirin alone, on the Indian strains of malaria; the results obtained in that series have been analysed for purpose of comparison along with those obtained with atebirin-plasmochin dragées.

A perusal of table I will show that the atebirin-plasmochin combination acts both on the asexual and the sexual stages of all the three species and that the time taken by *P. falciparum* and *P. vivax* for their complete disappearance is usually two to five days. A

small percentage, however, showed a delayed response, the parasites disappearing six days after the commencement of treatment. In cases of infection with *P. malariae*, the destruction occurs comparatively slowly; 50 per cent of the cases took more than six days for the parasite to disappear from the peripheral blood. The delayed response shown by some of the cases may be ascribed to two factors. In the first instance, some of these cases were chronic sufferers with an enlarged spleen; the blood was deficient and a lowered activity of the gastrointestinal tract existed. It is therefore likely that the absorption of the drug may have been hampered and the concentration in the blood necessary to produce the desired effect was not attained. The second factor responsible was that some of these patients were young children and care had to be exercised to avoid untoward symptoms and too small doses were perhaps given.

A comparative study of the effects of atebirin-plasmochin dragées and atebirin alone shows that, in cases of infection with *P. vivax*, the disappearance of the parasites by both methods of treatment is complete in the majority of the cases within four days, whereas with malignant tertian infection the combination removes them in a shorter time than atebirin alone. The reason of this will be obvious from a perusal of table II which shows that atebirin does not act on the crescents and consequently the sexual forms persist even after the course of treatment is over. In quartan malaria, atebirin alone produces even more rapid action than the atebirin and plasmochin combination.

Table II gives an idea of the comparative efficacy of these dragées on the asexual and the sexual forms of the different species. In benign tertian infection, the sexual forms are more rapidly affected than the asexual, but in the case of malignant tertian, this treatment produces practically the same effect on both forms. As regards quartan, the number of cases was unfortunately too small to enable us to form an accurate conclusion; the gametocytes seem to disappear more quickly than the asexual forms. The comparatively rapid destruction of the benign tertian gametocytes may be partly explained by their tendency to spontaneous disappearance.

A comparison of the effects of atebirin alone and with the combination dragées shows that atebirin produces a more rapid action both on the asexual and sexual forms of *P. vivax*, but in the case of *P. falciparum*, although it removes the asexual forms in the majority of cases within a short time, the sexual forms are rarely touched and persist even after the course of treatment is completed. In the case of *P. malariae*, atebirin alone appears to be as effective or even superior to the combined dragées with regard to their action on both the asexual and sexual forms.

Table III shows that there is no relationship between the parasite count and the number of days required for the complete disappearance of the parasites. The explanation may be that, in the concentrations in the body after administration of therapeutic doses, the drug may not possess a direct lethal action on the parasites and their destruction may be the outcome of certain processes in the body in which the reticulo-endothelial system probably plays an important part. This question is now being studied and the results will be published in due course. A perusal of this table will show that both the drugs behave in more or less the same way with regard to the relationship between the parasite count and their disappearance from the peripheral blood.

Relapses.—Out of a total of 39 cases treated with atebirin alone, five apparently relapsed while still under observation in the hospital. Out of 54 cases treated with the combination only two (one *P. falciparum* and one *P. vivax*) relapsed. This shows that the relapse rate is 12.5 per cent in case of atebirin and 3.7 per cent in case of the combination. The series of cases is very small, but in view of the fact that these trials were carried out under fully controlled conditions, the results are worthy of note.

Spleen.—So far as the effects on the spleen are concerned a soft spleen rapidly contracts when the patient is put on either treatment and the fever subsides. No difference could be observed in the case of the two treatments in this connection. The hard spleen of chronic malaria shows very little alteration.

Effect on the liver function.—Lævulose tolerance and van den Bergh's tests were performed

on a small series of 14 cases. A perusal of table IV will show that, out of these 14 cases, 5 showed an already defective liver. Of the remaining 9, the tests after the course of treatment could be done on 6 only, out of which 4 showed normal liver, and in 2 cases, the liver function was found to be slightly defective after the treatment. Further work is being carried on in this connection but from the small number of examinations that have been done we have formed the opinion that in ordinary healthy patients, who suffer from an attack of malaria, the administration of atebirin or atebirin-plasmochin dragées has no marked effect on the liver.

Untoward symptoms.—In the majority of the patients treated in this series, we have not met with any serious untoward symptoms. In some cases toxic symptoms undoubtedly did develop. One patient with malignant tertian infection developed the usual toxic effects after eleven doses of atebirin and plasmochin and looked cyanosed and collapsed. Stimulants had to be given and atebirin and plasmochin dragées had to be replaced by quinine. In another case of malignant tertian infection and in one of benign tertian, precordial distress was felt after the use of the dragées and they had to be stopped in the middle of the course of treatment. Two patients complained of slight epigastric pain and flatulence but could complete the course of treatment. There was a diabetic in our series who showed a marked rise in his blood sugar after the course of treatment. Yellow pigmentation of the whole body was observed in quite a large number of patients. The pigmentation disappeared in the course of a few days in most cases but in some, slight yellow coloration persisted even up to the time of discharge from the hospital. From a careful study of the two series of patients we have formed the opinion that toxic coloration is somewhat more frequent with the combination than with atebirin alone.

Summary and conclusions

(1) Comparative studies have been carried out in a small series of cases on the therapeutic effects produced by atebirin alone and atebirin-plasmochin dragées (containing atebirin 0.1 gm. and plasmochin 0.0033 gm.).

(2) In cases of benign tertian and quartan malaria the combination of the two drugs is not more effective than atebirin alone in so far as the time of disappearance of the parasites from the blood is concerned. In the case of malignant tertian infection, however, the combination appears to be more effective and the parasites disappear more rapidly from the peripheral circulation.

(3) With regard to the relationship between the number of parasites and their disappearance from the peripheral circulation, atebirin alone

(Continued at foot of opposite page)

ROLE OF INFECTION IN THE ÆTIOLOGY OF INFANTILE CIRRHOSIS OF THE LIVER

By SUBODH CHANDRA LAHIRI, M.D. (Cal.)
Physician, Chittaranjan Hospital, Calcutta

SINCE the first description of this disease by Dr. B. C. Sen (1887) in 1887, at a meeting of the Calcutta Medical Society different theories have been advanced from time to time by various observers about the underlying causes, but our knowledge does not seem to be much advanced. Dietetic errors in children and bad hygienic conditions are supposed to be the most

(Continued from previous page)

and atebtrin-plasmochin dragées behave in the same way.

(4) The relapse rate is definitely lower in cases where the combination of the two drugs is used than with atebtrin alone, in all forms of infections.

(5) There appears to be no difference in the two so far as the reduction of the size of the spleen is concerned.

(6) The combination of the two drugs is more toxic than atebtrin alone.

(7) Distinct advantage can be gained by treating cases of malignant tertian infection with the combination dragées especially when the sexual forms are present. In the case of benign tertian and quartan infections they appear to have no marked advantage.

It is fully realized that the series of cases dealt with in this paper is very small and that the conclusions are only provisional. We are grateful to Messrs. Bayer-Meister Lucius for supplying the dragées free of charge for these trials. The work is being continued with the combination of the two drugs with a larger dose of plasmochin (atebtrin 0.1 gm. and plasmochin 0.005 gm.).

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important ætiological factors. Early observers agree about them and they have been corroborated by many physicians of modern times. But there is no agreement about the particular form of diet which is prone to give rise to the symptoms. Thus Ghosh (1887), Coomar and Simpson (1888) and Bose (1890) ascribed the cause to irregular and overfeeding of undiluted, hard-boiled cow's milk along with bad hygienic surroundings. Mackenzie (1895), in North Canara, attributed it to giving irritating foods, seasoned with aromatics, early administration of starch, and the mother taking strong decoction of black pepper; but mothers are not accustomed to take these things in Bengal where the disease is so prevalent. Ghosh (1895), analysing 400 cases, ascribed the cause to mothers suckling their babies during pregnancy, bottle feeding of unwholesome milk, irregularity of feeding and overfeeding. Gibbons (1890) attributed it to giving unwholesome food, especially early administration of starch in large quantities. In cases where the child was having mother's milk alone, he ascribed the cause to the unhealthy state of the mother. Green-Armytage (1926) incriminates, among other factors, the excess of fat in cow's milk, whereas Gothoskar (1931) observes that the essential cause of this disease is starvation of infants, especially starvation in fats and sugar. Bhattacharjee (1931) reports that in many of his cases the fault of the diet was excess of sugar and deficiency of proteins. Castellani and Chalmers (1919) and also Manson-Bahr (1925) thought that it might be a form of infantile kala-azar. Against this latter view it may be said that Mukherjee (1928) made a routine examination of the blood of 292 cases of 'infantile liver', and no sign of kala-azar was present in any of his cases. The present author also examined the blood of some of his cases of 'infantile liver' for kala-azar, and he could find no sign of this disease in any of them. About alcoholism, syphilis, and malaria in parents, most of the observers agree with Gibbons (1890) that these have got nothing to do with the disease, though Iyer (1927) mentions that in Southern India syphilis is often found amongst the parents of the children suffering from this disease. Tirumurti and Radhakrishna Rao (1934) and Radhakrishna Rao (1935) regard the disease as a form of subacute toxic cirrhosis. Pandalai (1934) also regards it as a form of gastro-intestinal toxæmia resulting from early faulty feeding and a congenitally insufficient liver with inadequate defence powers.

Heredity.—It has been pointed out by Sen (1890), Ghosh (1887), Gibbons (1890) and others that the disease shows a familial tendency in many cases like the Hanot's type of cirrhosis.

The question arises whether dietetic error is the sole causative factor in the production of biliary cirrhosis in children. Simple enlargement of the liver due to dietetic error is often

seen in children but generally these latter cases are not progressive, there is no pyrexia, nor any enlargement of the spleen as in a typical case of infantile biliary cirrhosis. There are also cases in which, in spite of the best precautions taken about the diet and general hygiene, the children developed biliary cirrhosis and ultimately succumbed. The present author has also seen cases amongst children of the same parents all reared on exactly similar diets where only one of them developed the disease while others escaped. Though differing in details, clinically and pathologically the infantile hypertrophic biliary type of cirrhosis has many points of resemblance with the hypertrophic biliary type of cirrhosis described by Hanot. In the ætiology of the latter, infection is said to play an important part. In a previous paper by the present author (1933) and also in the present paper clinical evidence has been recorded which tends to show that infection may also be an important factor in the ætiology of infantile cirrhosis of the liver.

Experimental production of hepatic cirrhosis by infection

The importance of infection in the production of hepatic cirrhosis has been emphasized by many observers and many experiments have been carried out to demonstrate it. Adami (1898) and Hanot (1893) maintained that cirrhosis of the liver might be referable to chronic bacterial infection. Scagliosi (1896) and others found increase of the interstitial tissue of the liver after injections of various micro-organisms. Weaver (1900) produced cirrhosis of the liver by subcutaneous injection of a bacillus belonging to the colon group. Hektoen (1901) found that inoculation with a bacillus of the pseudodiphtheria group or its products produced necrosis and diffuse cirrhosis of the liver in guinea-pigs and other animals. Opie (1910) produced hepatic cirrhosis in dogs by first giving the animals small doses of chloroform for several successive days and, when the liver was sufficiently damaged, administering intravenously small doses of bouillon culture of *Bacillus coli* or streptococci. The animals died after several days, developing hepatic cirrhosis. He further demonstrated that hepatic cirrhosis was not produced by chloroform alone, nor by infection without previous devitalization of the hepatic cells.

Several experiments were carried out by the present writer on puppies 1 to 2 months old, in the light of Opie's experiments mentioned above, and also his own clinical observations in cases of infantile cirrhosis of the liver. Details of the experiments were published in another paper by the present writer (1933) which also contains a full and up-to-date bibliography on the subject of the paper. An attempt was made in these experiments to combine two factors, *viz.*, devitalization of the hepatic cells and a chronic

infection. The devitalization was attempted by long-continued dietetic errors. Excess of fat in diet is known to upset the digestion and easily derange the functional activity of the liver in children. Hence a high fat diet was given to the animals in this series of experiments. They were also given intraperitoneal injections of gradually increasing doses of colon bacilli. These animals lived for more than a month and presented a clinical picture which resembled cases of infantile cirrhosis of the liver in their early stages. The liver was palpable just beneath the costal margin. There was also continued pyrexia with gastro-intestinal disorders, the stool being almost whitish in colour. Microscopically the change noticed in the liver in these animals was an extensive fatty degeneration of the hepatic cells. There was also round cell infiltration in many areas and along with it a proliferation of fibrous tissue in some of the lobules. Delicate strands of connective tissue fibres were seen spreading amongst the columns of the liver cells. In several areas these connective tissue fibres were found to surround small groups of liver cells and isolate them from the rest of the hepatic tissue. There was no proliferation of the fibrous tissue in the portal areas, and the increase was mainly monolobular.

Hepatic cirrhosis in man associated with the presence of infection

Cases of cirrhosis have been reported from time to time in which the presence of bacilli could actually be demonstrated in the liver. Gilbert and Fournier (1897) reported a case in which colon bacilli had been found in the blood withdrawn by puncture from the liver during life, and subsequently in the liver and spleen in the same case post mortem. Mallory (1911) examined the livers from two cases of 'juvenile cirrhosis' for bacteria and found slender bacilli, possibly *B. coli*, in one of them. Moon (1929) reports two cases of cirrhosis occurring in children where the presence of streptococci was demonstrated in the liver and spleen. Moncrieff and Steen (1929) report a case of early biliary cirrhosis in a boy aged 9 years after an attack of acute rheumatism. Calvert (1911) mentions that cirrhotic changes have been found in the liver in children after the exanthemata. Regarding infantile cirrhosis Pearse (1911) said, that taking all things into consideration, he could most reasonably conclude that it was a parasitic disease, but whether it was microbic in origin, or due to larger parasites there was no evidence to show. Bhattacharjee (1932) made leucocyte counts of his cases of infantile cirrhosis of the liver, and the count was high in all. The question of the presence or absence of infection in this disease still remains unsettled. But the former possibility merits serious attention when we turn to the clinical signs and

symptoms of the disease, because fever, enlargement of the spleen along with hepatic enlargement, and some amount of leucocytosis is present in many cases. In this connection it is interesting to note that the onset and the course of cases reported by some of the pioneer observers typically resembled an infectious disease. Thus, in two of the reported cases of Gibbons in which post-mortem examinations were made pyrexia was a prominent symptom. His case no. 3 had an attack of fever accompanied by convulsions, and when the child recovered from this, his mother noticed that the abdomen was distended (due to enlargement of the liver). Ghosh (1887) noticed that in some cases the enlargement of the liver was preceded by remittent fever, the enlargement appearing about a week after the invasion of the fever. In some instances there was slight fever for a month or so, and then the liver was found to be enlarged.

Personal clinical investigations

The present writer investigated the ætiology of twenty-five consecutive cases presenting typical clinical features of infantile cirrhosis of the liver. The following points were noted:—

Mothers' health.—The health of the mothers in most of the cases was bad. Almost all of them were suffering from chronic dyspepsia. They were all habituated to indoor life.

Sex.—Males 22 cases, females 3 cases.

Food.—Gross dietetic errors were noticed in only a small number of cases, but a history of irregular feeding was present in all and this is unfortunately very common in Bengalee households.

Two of the patients were reared principally on patent foods. Others used to have mother's milk supplemented by cow's milk, barley water and patent foods. Grown up children used to take rice, fish, milk, pulse, curries, sweets and other common Bengalee foods.

Blood picture—Leucocyte count.—The total count was generally between 10,000 and 20,000 per c.mm. In one case 25,000.

Differential count.—Small mononuclears generally 44 to 60 per cent. Polymorphonuclears 22 to 47 per cent.

Agglutination test.—Against *B. typhosus*, *B. paratyphosus A* and *B. paratyphosus B*, negative in 1 in 20, and other dilutions; agglutination against *B. coli communis* was tested in 2 cases, and was positive in 1 in 50 dilution in one case.

No malarial parasites could be found in any case and there was no response to quinine in any case.

Aldehyde test and culture for Leishman-Donovan bodies were negative in all cases that were examined for them.

Blood culture.—Blood culture was made only in one case. A strain of hæmolytic streptococci was obtained after 72 hours' incubation. An

important point about it was that the organism was obtained from the blood early in the disease when the patient was not having any rise of temperature. The case ended fatally, ultimately developing jaundice and ascites. There was slight secondary anæmia in most of the cases.

Liver.—In one case enlargement of the liver was noticed several days after the onset of fever, a fact also noticed by Ghosh (1887) in some of his cases. In other cases the liver was already enlarged and hard when first examined.

Spleen.—This was enlarged in sixteen cases. Enlargement occurred after the fever had continued for some time, and always after the enlargement of the liver. Enlargement was generally about 1 to 2 finger-breadths below the costal margin.

Urine.—Quantity normal or slightly less. No difficulty in micturition in any of the cases.

Reaction acid in all cases. In two cases, showing *B. coli* on culture, the urine could not be made alkaline even after giving daily 30 to 45 grains of alkali, in the form of citrates, acetates, bicarbonates, etc., along with plenty of fluid for about 3 weeks. But one interesting fact noticed in both the cases during that period was that a few hours after every injection of autovaccine there occurred a copious diuresis and the reaction of the urine was invariably found to have turned alkaline. This was noticed even when there was a reactionary rise of temperature. But this effect quickly passed off though the patients were taking alkali in the same doses as before. The urine again turned acid either the next day or the day after.

General examination.—Albumin was present in traces in three cases. Pus cells were present in small numbers in all the cases. Hyaline casts were present in two cases.

Gibbons (1888) noticed evidence of parenchymatous nephritis in post-mortem examination of his case no. 1.

Technique of urine culture.—The urine was collected for culture in a sterile test-tube after properly cleansing the glans penis and external urethral orifice, following retraction of the prepuce. After the urine had flowed freely, the last portion only of it was collected for culture. In this connection we may recall the observations of Cumings (1931), who found that in specimens of urine collected in this way from healthy boys and girls, without using the catheter, the urine was sterile in 90 per cent of boys and 80 per cent of girls. Willcox and Matthews (Price, 1933) also recommend the above procedure of collection of urine for culture in cases of males. In the experience of the present observer, also in cases of male children, the above method of collection of urine for culture compares not unfavourably with catheter specimens. In the latter case the catheter has to pass through a long urethral tube which is by no means sterile, and in its passage through the urethral canal the catheter

may carry along with it some of the contaminating organisms and thereby contaminate the urine in the bladder. This may be obviated by allowing the first portion of the urine to flow off, thereby washing out the urethral passage, and then collecting the last portion of it in a sterile test-tube.

Findings.—*B. coli* in 11 cases; streptococci in 13 cases. No growth in 2 cases, one of whom (a female child) showed streptococci on blood culture.

Organisms found	Total number of cases	Male	Female	REMARKS
<i>B. coli</i> ..	11	all	nil	One case showed both <i>B. coli</i> and <i>Streptococcus hæmolyticus</i> in urine.
Streptococci	13	11	2	Do.
No growth	2	1	1	..

In one case altogether four different samples of urine were cultured on different dates of which two showed *B. coli*, and two others were sterile, demonstrating that in chronic cases a negative result on one examination was not conclusive. It is possible that in some cases the bacilli may be excreted in showers with negative phases in the interval. It may be mentioned here that the case just referred to had severe febrile reaction after each of the two autovaccine injections and was ultimately cured by stock vaccine. Another case showed *B. coli* on urine culture on three different examinations at an interval of more than a month each time. A third case showed streptococci in the urine on two different examinations at an interval of nine months and was ultimately cured by autovaccine injections. A similar case also showed streptococci in the urine on two different examinations made at an interval of about eight months.

Streptococcus hæmolyticus.—At first streptococci were not studied as to which type they belonged. Later on the importance of typing was realized and this was done in the last five cases out of seven where streptococci were found. Of these, four cases which ended fatally showed *Streptococcus hæmolyticus* on blood and urine culture. One case, who had been apparently cured, showed doubtful results. The first case, a female child, showed *Streptococcus hæmolyticus* on blood culture. She later on developed ascites and jaundice and died. The second case, a male child, showed *Streptococcus hæmolyticus* and *B. coli* on urine culture. He later on developed ascites and jaundice and left Calcutta and nothing was heard of him subsequently. The third case is rather interesting from this

point of view. He is the third child of the mother whose two former issues died of infantile cirrhosis of the liver. His urine was cultured when he was only three months old and when there was no sign of the disease present. It showed a pure growth of streptococcus of the non-hæmolytic type. He was given a course of intestinal bacteriophage and later on put on urotropine. He was sent out of Bengal with advice about his diet and mode of living. Six months later, when he was at Benares, during the summer, he began to get slow rise of temperature, with some enlargement of the liver, constipation, and loss of appetite. He was brought down to Calcutta and a clinical diagnosis of the onset of infantile cirrhosis of the liver was made. Culture of urine now showed a pure growth of streptococcus of which some colonies showed small areas of hæmolysis on blood agar. He readily responded to treatment and has left Calcutta for a change, where he is reported to be doing well. The fourth case, a male child, showing *Streptococcus hæmolyticus* on urine culture, later on developed ascites and jaundice and died. The fifth case, a male child, showed typical signs and symptoms of infantile cirrhosis of the liver. His urine culture showed *Streptococcus hæmolyticus*. The case was progressively getting worse, and he subsequently developed broncho-pneumonia and died of it. (The investigations of the last two cases were made by Dr. S. K. Basu to whom my best thanks are due). Thus the cases showing *Streptococcus hæmolyticus* in blood or urine had an unfavourable prognosis in the present series of cases.

The significance of the presence of bacteria in the urine in the present series of cases

It may be stated here that out of the twenty-five cases recorded in the present series twenty-three showed the presence of either *B. coli* or streptococci in the urine, and one had streptococci in the blood.

We may now discuss the various conditions in which bacilli may be detected in the urine of a child.

Apart from contamination this may occur—

(a) In cases of general septicæmia.
(b) In cases of infection of the urinary tract, the bacilli having reached the kidneys either through the blood stream, the lymphatics, or direct from the bowels by tissue-contiguity [Pearson and Wyllie (1928)] or carried from outside by external interference.

(c) In cases of infection localized elsewhere in the body; the organism entering the circulation and being excreted through the kidneys.

(d) In cases of simple bacilluria without any pathological significance.

Simple bacilluria without any pathological significance is rare [Beeler (1916) and Helmholtz (1916)]. It mostly occurs by the upward passage of the organisms along the urethral tract

and is generally seen in cases of female children owing to the proximity of their anal and urethral openings. It is very unlikely in cases of male children. It may also be stated that pus cells are generally absent in the urine in cases of simple bacilluria (Pearson and Wyllie) and that the organisms present in the urine in such cases have generally been found to be diphtheroid organisms, *B. coli*, staphylococci and very seldom streptococci (Mellin, 1903).

As regards cases where the infective organisms reach the kidneys through the blood stream from a source of infection situated elsewhere in the body, we may note that while in the course of their excretion, the organisms may, in some cases, produce infective lesions in the urinary tract, in other cases they are simply excreted without causing much irritation. In this connection we may quote the observations of Biedl and Kraus (1895) who found that *B. coli* and other organisms might be excreted by the kidneys in half to one hour's time after their introduction into the circulation, before any local injury took place.

With respect to the colon bacillus infection, a possibility is generally recognized that this may occur from intestinal disturbances, the organisms reaching the kidneys through the blood stream [Bugbee (1925), Forbes (1910), Wilkinson (1930) and Schwartz (1918)]; and it is possible that while circulating in the blood, these bacilli may infect the biliary tract as well. Goerter and Lignac (1928) observed that pyelitis might be associated with jaundice, probably due to infection of the biliary tract. We must also admit the possibility that hæmatogenous infection of the biliary tract may occur apart from bacilluria. Levy (1921) further observed that definite bacillæmia with colon bacilli might occur without bacilluria.

Rôle of infection in the present series of cases

It may be noted in the first place that while the presence of bacilli in the urine is not pathognomonic of infection, the signs and symptoms such as fever, enlargement of the spleen along with the enlargement of the liver, leucocytosis, febrile reactions to autovaccine (prepared from urine and blood culture), and ultimate recovery from the disease by vaccine injections in some cases point to infection being an important ætiological factor. The presence of hæmolytic streptococci in the blood of one of the cases also favours the same view. But it may be noted that though in most of the cases the presence of bacilli could be demonstrated in the urine, symptoms of bladder or renal disease were practically absent. In the presence of other evidence of infection this may be taken to mean that the real site of infection was not in the urinary tract but elsewhere in the body, the bacilli being simply excreted through the kidneys. The conspicuous hepatic features of the cases point to the liver being the chief site

of infection. It is interesting to note that slow pyrexia, as observed by Pardoe (1910) in cases of chronic *B. coli* infection, closely resembled that generally seen in many cases of infantile cirrhosis of the liver. He stated that in chronic *B. coli* infection there was slow fever, the rise of temperature often occurring late at night. Periods of such illness often alternated with periods of comparative good health, when there would be no fever and the patients would be free from subjective symptoms.

From the facts recorded above we may conclude that in many cases presenting typical clinical features of infantile cirrhosis of the liver, infection plays an important ætiological rôle.

Rôle of dietetic errors in the ætiology of infantile cirrhosis of the liver

From the facts discussed above, infection seems to be an important ætiological factor in causing infantile cirrhosis of the liver. But the power of the liver to withstand and destroy infective organisms is well known. In fact it is regarded as the most important defensive organ of the body. Roger (Rolleston and McNee, 1929) states that sixty-four times the dose of living anthrax bacilli, which kills an animal when injected into a peripheral vein, may be introduced by the portal vein without fatal effect. It has also got an extraordinary power to regenerate and compensate for injury, as demonstrated by the experiments of Mann and Bollman (1926) who found that the removal of 70 per cent of the liver of a normal dog was followed in a few weeks by regeneration of the remaining 30 per cent to approximately the preoperative level. In order that an infection may gain a foothold in an organ with such an extraordinary vitality, it is necessary, though not absolutely essential, that it should be previously deranged by long-continued dietetic errors or by some other devitalizing factors.

Pathogenesis

Opie experimentally demonstrated that for the production of hepatic cirrhosis two factors are necessary—first, damage and devitalization of the hepatic cells, and second, an infection by a 'relatively non-pathogenic' micro-organism. Adami (1914) has shown that normally micro-organisms are being constantly carried away from the intestines and are being killed in the mesenteric nodes and the liver. When there is irritation and consequent damage and devitalization of the intestinal epithelium a greater number of bacteria will gain entrance and cause a greater wear and tear of the liver cells. In cases where the hepatic cells have already been devitalized by long-continued dietetic errors, or have been specially predisposed by heredity or some other causes, they can no longer withstand the constant invasion of the intestinal micro-organisms. Colon bacilli or streptococci, on

gaining entrance, may now destroy the already damaged liver cells and at the same time stimulate the connective tissue cells to increased growth (Adami and McCrae, 1911), or as Rosenow (1913) puts it in another connection, following the destruction of the more highly differentiated cells, in favourable circumstances there might have been regeneration and 'restitutio ad integrum', but in unfavourable circumstances there occurs a replacement, a fibrosis.

Examination of mother's milk.—There is a widespread belief in Bengal that suckling of unwholesome mother's milk is an important cause of the 'infantile liver' in children, and as a precautionary measure, mother's milk is often stopped from birth, or at the first sign of appearance of this disease, where there is history of it in the family.

In relation to this point the present author made cultural examination of mother's milk simultaneously with the child's urine in 4 cases with the following results:—

Cases	Mother's milk	Child's urine	Mother's health
No. 1	<i>B. proteus</i> ..	Streptococci	Mother had pyorrhœa alveolaris with chronic constipation and indigestion.
No. 2	<i>B. coli</i> ..	<i>B. coli</i>	Mother had chronic constipation and had slow fever for long time before child-birth.
No. 3	Non-lactose fermenting coliform bacilli. Lactose —. Glucose +. Mannite —.	Streptococci	Mother constipated.
No. 4	Cocci (Gram-positive).	<i>B. coli</i>	Mother had pyorrhœa alveolaris, chronic constipation, and chronic cholecystitis.

Outline of treatment adopted by the present author

1. Rectification of dietetic errors so as to avoid overtaxation of the hepatic cells and damage and devitalization of the protective intestinal mucosa. This was attempted—

(a) by stopping altogether all disagreeable foods,

(b) by giving nutritious and easily digestible foods at regular intervals,

(c) by rectifying the deficiency in vitamins, as the low vitamin content of the diet may help

intercurrent infections, even without producing the specific signs of avitaminosis. (Thus in deficiency of vitamin B there is said to be a derangement of the functions of the digestive tract and also devitalization of the protective intestinal epithelium). Bactericidal power of the blood is also said to be diminished in cases of deficiency of vitamins A, B and C and along with it an increased susceptibility to infection [Hess (1917), Hess (1932), Findlay (1923), Cramer and Kingsbury (1924), and Abels (1924)].

2. Stimulating the general metabolic processes and thereby increasing the somatic resistance against the chronic devitalizing subinfection—

(a) by general hygienic measures such as regular sponging or baths, sunlight and fresh air,

(b) by a few short exposures to ultra-violet rays when possible,

(c) by change to a better climate when possible.

3. Medicines—

(a) to improve the condition of the bowels, and help digestion when necessary,

(b) to stimulate the hepatic functions, e.g., by giving bile salt (sodium taurocholate) in small and repeated doses, and also ipecacuanha,

(c) to inhibit the growth of intestinal flora by giving hydrargyrum cum creta and other antiseptics in minute doses. Intestinal bacteriophage may also be given, but one must be sure about the reliability of the product. The present author has seen aggravation of the gastro-intestinal symptoms on using some of the available products,

(d) to inhibit the growth of bacteria infecting the biliary tracts. For this purpose urotropine and salicin seemed to be the best medicines. They were prescribed after irritation of the gastro-intestinal tract had subsided. Alkali was given according to necessity.

4. Injections of auto- or stock vaccines were given with encouraging results, in some of the cases not responding to the above measures. *B. coli* autovaccine even in such minute doses as 1/10th or 1/20th million produced severe febrile reaction in two cases. Stone (Forchheimer, 1924) points out that in using autovaccines it should be remembered that some strains of *B. coli* cause severe local and general reactions. The best result was obtained in this series by using stock *B. coli* vaccine of St. Mary's Hospital in doses of $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, 1, 2, 3 millions in children 1 to 2 years old, taking care about the individual susceptibility. Streptococcal autovaccines were also used in similar doses to the above in cases where streptococci were present in the urine. In two cases pyrexia seemed to start after the autovaccine injections, and continued until the cases ended fatally. In those

cases which responded to vaccine therapy the fever generally stopped after three or four injections, the liver and spleen diminished in size and the general health greatly improved. In using vaccine therapy the present author has found it advisable to commence with very minute doses in order to avoid reactions, as reactions have always made the cases worse. Advanced cases, very young babies, and also patients in a very bad state of health did not respond well to vaccine injections.

It should be noted that to be of any use the treatment must be commenced early, and no benefit may be expected from any treatment if the tissues are damaged beyond repair.

Summary

Subinfection especially by *B. coli* or streptococci, supervened on an already devitalized and overtaxed liver, may be an important factor in the ætiology of infantile cirrhosis of the liver. Detection of *Streptococcus hæmolyticus* in urine or blood culture in most of the fatal cases of this series is of interest.

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IMMUNOLOGICAL METHODS IN THE DETERMINATION OF INFECTION IN A RANDOM SAMPLE OF HOSPITAL ADMISSIONS

PART II

(THE FREQUENCY AND CONCENTRATION OF AGGLUTININS FOR PROTEUS X STRAINS IN A SERIES OF HOSPITAL PATIENTS)

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(From the Bacteriological Department, School of Tropical Medicine, Calcutta)

In the last number of the *Gazette* Pasricha, Panja and Lal (1936) recorded the results of an investigation into the frequency and concentration of agglutinins for the enteric group of organisms in sera collected from 280 Indian patients admitted into the Carmichael Hospital for Tropical Diseases. These sera were also used for the estimation of agglutinins for the proteus X strains X19, X2 and XK.

TABLE I

The number of individuals examined, the percentages of sera giving agglutination at specified titres or higher, with proteus X19, X2 and XK.

Organism	Number of individuals examined	TITRE		
		1 in 25 and over	1 in 50 and over	1 in 100 and over
Proteus X19 ..	280	55.7	23.2	1.4
Proteus X2 ..	259	11.2	2.7	0.0
Proteus XK ..	77	68.8	29.8	7.8

Thick 'O' suspensions of the organisms were made and diluted before use. The serum suspension mixtures were kept in the water-bath at 52°C. The readings were made after 18 hours with the help of artificial light against a black background and the agglutination was read to the limit of visibility with a magnifying lens. Only clear cut definite results were recorded. Adequate controls were maintained throughout.

Each serum was put up in five dilutions from 1 in 25 to 1 in 400. In a number of instances, owing to the small quantity of serum available, it was not possible to put up each serum with all the three antigens. This is indicated in the results which are given in table I.

TABLE III

The percentage of sera obtained from individuals in the labouring and non-labouring classes giving agglutination in 1 in 25 or over with different proteus X strains

Organism	LABOURING CLASS		NON-LABOURING CLASS	
	Number examined	Percentage positive	Number examined	Percentage positive
Proteus X19 ..	177	55.3	103	56.2
Proteus X2 ..	167	13.7	92	6.5
Proteus XK ..	44	70.4	33	66.6

TABLE IV

The percentage of sera obtained from males and females giving agglutination in titres of 1 in 25 or over with proteus X strains

Organism	MALES		FEMALES	
	Number examined	Percentage positive	Number examined	Percentage positive
Proteus X19 ..	237	54.9	43	60.4
Proteus X2 ..	225	10.6	34	17.6
Proteus XK ..	59	66.1	18	77.7

TABLE II

The percentage of sera in different age groups showing agglutinins for proteus X19 and X2. Owing to the paucity of the number of sera tested with proteus XK the results obtained with this antigen are not included in this table

Age group			PROTEUS X19			PROTEUS X2		
			Number of persons examined	Number showing agglutinins	Percentage positive in 1 in 25 or over	Number of persons examined	Number showing agglutinins	Percentage positive in 1 in 25 or over
0-10 years	..	..	15	5	33.3	15	0	0.0
11-20 "	..	..	49	28	57.1	44	8	18.1
21-30 "	..	..	112	57	40.9	108	10	12.0
31-40 "	..	..	60	40	66.6	57	6	15.8
41-50 "	..	..	30	17	56.6	25	5	20.0
51 and over	..	..	14	9	64.2	10	0	0.0

TABLE V

The percentage of sera obtained from individuals suffering from various diseases other than typhus or enteric fever giving agglutination in titres of 1 in 25 or over with proteus X19, X2 and XK

Clinical	PROTEUS X19		PROTEUS X2		PROTEUS XK	
	Number of persons examined	Percentage positive	Number of persons examined	Percentage positive	Number of persons examined	Percentage positive
Splenomegaly	19	26.3	18	5.5	4	2.5
Kala-azar	8	50.0	7	0.0	1	0.0
Malaria	23	47.8	23	17.2	5	..
Miscellaneous febrile patients ..	52	55.7	49	9.1	23	60.8
Miscellaneous afebrile patients ..	178	60.1	162	11.7	44	75.0

Although rigid conclusions are to be deprecated because of the small numbers on which some of the percentages are based it is obvious that sera from a large proportion of 'non-typhus' individuals agglutinate in low dilution suspensions of proteus X strains; some 55 per cent of our series of 280 agglutinate in dilutions of 1 in 25 'O' suspensions of proteus X19, 11 per cent of the tested agglutinate similar suspensions of proteus X2 and 68 per cent of the 77 tested agglutinate proteus XK. These results are similar to the findings of Scales referred to by Boyd (1935) who examined 100 healthy Indian soldiers and 50 British soldiers in India. Scales' findings were:—

OX2: About 30 per cent of those tested gave titres from 1:25 to 1:50.

OX19: About 30 per cent of those tested gave titres from 1:25 to 1:50.

OXK: About 67 per cent of those tested gave titres from 1:25 to 1:50; one gave a titre of 1:125.

Scales (1935) records the Weil-Felix reaction in 100 healthy Indian soldier volunteers. He found no agglutinins in 18 per cent of the Indian soldiers; 81 per cent showed agglutinins from 1 in 25 to 1 in 50, and one showed agglutinins up to a titre of 1 in 125, whereas in this series of 50 British soldiers no agglutinins were found in 36 per cent and agglutinins in titres from 25 to 50 in 64 per cent. In the latter series in no individual was a titre of over 50 noted. Further information such as the detailed history of the individual British soldiers, particularly as regards the duration of their stay in India or residence in other parts of the world, is necessary before any conclusions can be drawn from these figures. Based on the observation that the percentage showing no agglutinins in the British troops is double the percentage in the Indian troops, the inference that we can draw is, that conditions are more prevalent in India which lead to the development of agglutinins for the proteus X strains than in Britain. It is the difference in the percentages that is

most significant and the different frequencies observed in the case of the British and Indian soldiers suggest a greater risk of infection in the Indian soldier as compared to the British soldier.

We are not aware of any published data with regard to the frequency and distribution of agglutinins for proteus X strains among the civil population. Our results show that a large percentage of the sera obtained from our series of hospital patients show agglutinins for these organisms.

When we attempt to correlate the presence of agglutinins with infection we are faced with many difficulties. We failed to obtain evidence of previous infection from any of our patients. It is also necessary to consider to what extent, if any, this serological evidence can be regarded as evidence of past infection, and further to what extent, if any, this serological grouping according to the various strains of proteus X can be regarded as true differentiation of different types of the disease. The subject is far too intricate for us to enter into any discussions of it in the present paper. There is a voluminous literature on the subject. We can, however, accept the view that the frequency of agglutinins in any community affords an indication of the frequency of a particular infection in that community. If we accept this, and pending further information, we may take it that the results obtained by this survey, which is analogous to the survey carried out for the enteric infections, indicate that there are many individuals who have at some time in their lives been infected with one or other type of typhus fever.

We would stress that the total number of individuals examined is small and the investigations are in some ways incomplete, but nevertheless the results of the tests indicate certain deductions. These may serve as a basis for future observations.

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INVESTIGATION OF YAWS (KOYA DISEASE) IN WARANGAL

By C. F. CHENOY, M.B., B.S. (Bom.), D.T.M.
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Assistant Director of Public Health

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YAWS (frambæsia) is a disease of the tropical world. It is very common in the jungles of Africa. It is said to be present in the jungles of Assam and Ceylon, but rare in India.

Its detection in Warangal

One of the writers (M. A. S.) while attending a shikar camp at Paloncha in 1930 saw a case resembling tertiary yaws. He first suspected this to be leprosy and sent the case to the Dichpalli Leper Asylum where it proved to be negative. He noticed a few similar cases. In 1931 he took up the investigation and visited the forest areas of Mulug and Narsimpet taluqs. He forwarded slides for examination to the laboratory, which were returned as negative. Again in 1932 he toured through the jungle tracks of Madhra, Yellandu and Paloncha seeing many cases. He was transferred and unable to continue his investigation. In April 1935 the senior writer saw a few cases of yaws at Borgam-phad and in a few villages of Mahabubabad taluq. Again in November 1935 he visited Mulug and Narsimpet and saw yaws cases; the slides from non-suppurating cases sent to the laboratory showed *Spirochaeta pertenuis*.

In January 1936 the disease was again studied in Mulug and Narsimpet taluqs. Yaws was not previously known to exist in these jungles but there is no doubt that it not only exists but is fairly widespread in the eastern parts of Warangal district. This disease is called 'Koya rogam', or 'gondi rogam' and was well known to the forest people.

Epidemiology

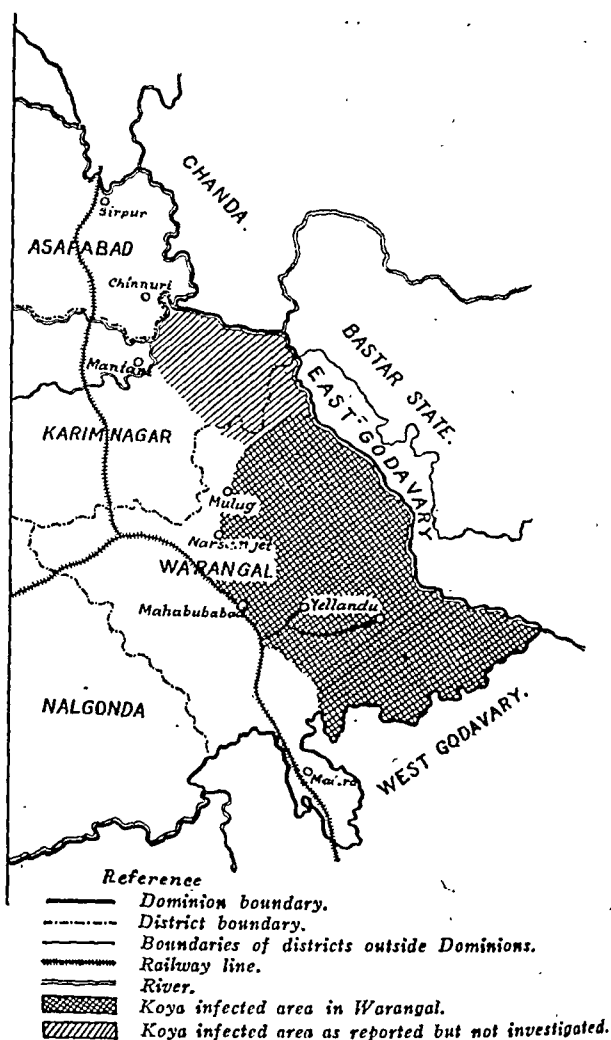
This disease is confined mostly to the Gonds or Dorras, who are also called 'Koyas' and hence the disease is known as 'Koya rogam' (disease of Koyas). The disease is also found among the Manay Puwarlu (people of the

forest or as known in Madras, Panchamas, i.e., 5th class of Dheers), who live among the Koyas.

Over 200 cases with *koya* were seen, all among persons of the dense forest area. The percentage of *koya* disease among the population could safely be said to be over 5 per cent. Of the 200 cases investigated, 164 were Gonds, 10 Manapoles, 10 Mangs, 8 Dheers, 4 Bhois and 4 Naikpores.

There seems to be hardly any age limit. It occurs among babies, infants, children, young and old men and women.

MAP



Ætiology

The cause of infection has not yet been traced. Among the Gonds it is said to be the red ant, so common in forests. The Gonds refuse to stay or sleep in huts which have been occupied by cases of *koya*, fearing infection. They also believe in direct contagion. Investigation is still going on and one of us (A. C. A.) has been deputed to carry out further investigations in this district.

Castellani in 1907 found *Treponema pertenuis* in *Musca domestica* which had fed on scrapings

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In Jamaica, Kumm, Turner and Peat found that the commonest fly feeding on yaws ulcers was *Hippelates pallipes* (Loew). This West Indian fly's feeding habits and particularly the mechanism of regurgitation of a 'vomit-drop' led them to suspect this insect as a natural vector of yaws. They have demonstrated motile *Treponema pertenue* in the vomit-drops of these 'eye gnats' after they have been fed on infectious frambæsia lesions. They have further found that this *Hippelates pallipes* does not show *Treponema pertenue* later than 48 hours after the infecting feed, nor has any evidence of invasion been found in the salivary glands or proboscis, or of any cyclical development of the spirochætes in the fly up to 28 days after the initial meal on the yaws lesion. They mention three important factors necessary for the infection in nature of flies seeking food on the yaws lesion.

1. The scab should not be intact.
2. The lesion surface must be moist or exuding serum, but no pus must be present.
3. *Treponema pertenue* must be present in abundance in the lesion itself.

Laboratory findings

The laboratory investigation was undertaken, (1) to find out the transmitting agent, and (2) to prove spirochæte infection.

1. *Vector*.—All available domestic insects and parasites were caught and dissected but no spirochætes were detected. As the season was not very favourable for the breeding of some of the most suspected insects, viz, the eye fly (*Siphonella funiculi*) and the domestic fly (*Musca domestica*), the investigation will be continued in due season.

2. *Spirochæte infection*.—

(a) *Microscopical*.—The method adopted to find spirochætes was to clean the primary papules or secondary ulcers with saline solution, and after an interval slides were prepared from the fresh exudate. Pus or blood was avoided. The slides were stained by the Indian ink, Giemsa's and Fontana's silver nitrate methods.

Spirochætes were readily found in the unbroken primary papules, and in early secondary ulcerations, slides prepared from chronic ulcers did not show spirochætes but many infective organisms were present.

(b) *Serum test (Kahn's precipitation test)*.—The total number of Kahn's tests performed was 71. Sixty-six cases gave definite history of yaws and most of these were suffering from the disease at the time of examination. As controls five cases giving no history of yaws and clinically diagnosed as scabies were included.

Kahn's test was positive in the 66 suspected cases, a majority showing a 4-plus result and five controls were negative.

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Gonds and Dorras

They are a primitive race probably of Dravidian origin, living in the forest in thatched huts. The *gumpoo*, or village, is a group of 5 to 20 dwellings under a headman, who is known as the *pedda dorra*. This *pedda dorra's* word is a law and it is final. The Dorras are very particular about caste distinction. With few exceptions the dress consists only of a loin cloth. The standard of living is very poor. No lights are seen in the village; kerosene oil is not known. They are however very particular about their personal cleanliness, and keep their houses scrupulously clean. They are a hardy race, very clever in hiding in the forest and when startled climb trees like monkeys.

They are semi-starved, very fond of toddy, distilling their own liquor and are often drunk. Some live on grain grown in their fields, but most of them live on tuberous bulbs, honey and toddy. They commonly eat four kinds of tuberous roots. The plant which grows from the bulbs are all creepers. These bulbs are called *nella senna gadda*, *tella senna gadda*, *govinda gadda* and *yelleri gadda*.

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The way they drink water is to bend on knees and elbows and drink direct from the stream.

Marriage and death parties are nothing but mere drinking bouts. Wives are either bought or kidnapped. There is no regular marriage ceremony. The only ceremony is that the man who wishes to marry a girl approaches her and bites her finger till blood appears. The contract is recognized by both families joining in a drinking bout.

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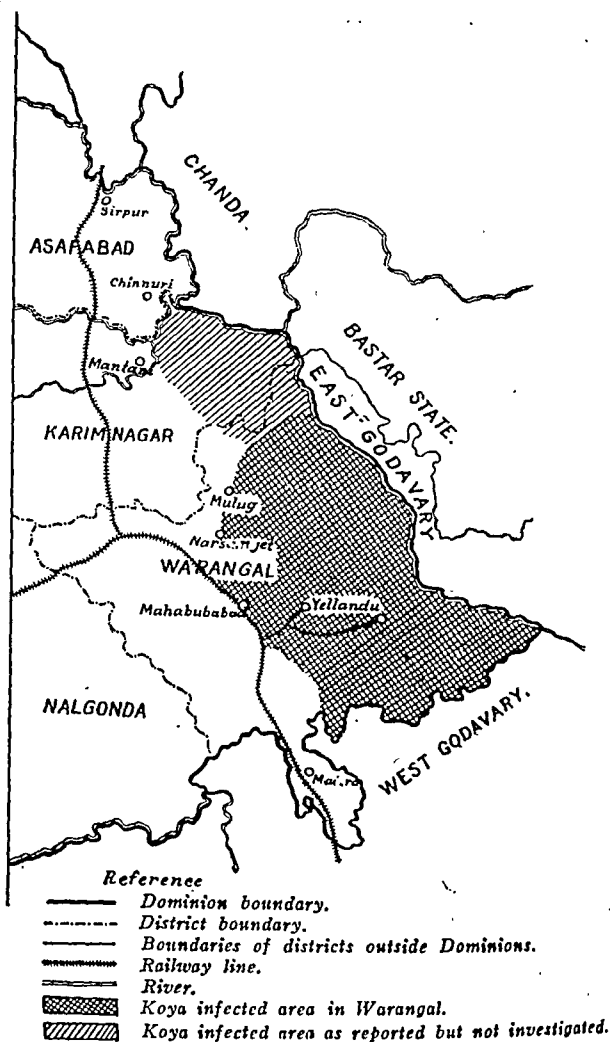
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These Gonds are very particular about *koya*-infected girls; those with any symptoms remain unmarried.

Each family has a few chickens and a buffalo or a cow. The milk they rarely drink, but make into ghee, which they take miles away to the *soukar*, who in exchange gives a quarter of the value in sweet oil, salt or chillies. Their trade is basket and *tatty* making and tapping

toddy trees. They are very honest. From time to time officers have persuaded them to take up menial service but they soon get tired of civilization and return to the dense jungles.

Geographical distribution of yaws

In Hyderabad it is confined to the jungle tract known as 'Kurva Pati'. This extends from Madhra taluq, passes through Paloncha, Narsimpet and Mulug taluqs of Warangal district to the Manthani taluq of Karimnagar district.

It is believed to exist in Bastar State on the other side of Kodavari, in East Godavari area and also in the Chanda forest. It is not yet reported from the Asifabad jungles, but if it is present in Chanda the infection should be found in Asifabad area. Further investigations are being made.

Earlier literature—Hindu and Arabic

No mention is found in Hindu literature, or books on medicine or Shashtras. Many Abyssinians have been employed in Hyderabad for the last 200 years or more; it is possible that this disease was brought from Africa. We are told that Arabian writers like Ali Abbas and Ibsina (Abicenna) have mentioned it as 'existing in the east' under the name of 'Shafaat'. Where it first started could not be traced. One Gond, who is over 90, says it was known in his great grandfather's time.

Epidemiology, endemiology and ætiology

The history of infection requires further investigation but from what little one could elicit it seems that it is contagious. The contagion undoubtedly spreads by direct contact with the primary and secondary ulcers if the continuity of the skin is broken. On healthy and intact skin the exudate or direct contact of ulcers appears to have no action. The Gonds believe that the infection is through direct contact with infected persons and no Gond or Koya will marry a girl suffering from *koya* for fear of infection.

The following cases certainly indicate direct contagion :

1. A boy visited another village and stayed there. He developed *koya*. This disease was not present in his *gumpoo* (number of huts). Later on, the other children with whom he played developed *koya*. It is said that 'if one child gets the disease in the family then all the children are sure to get it'.

2. In many cases women with infected children develop the primary sore on the nipples. In these cases it was found that the baby's mouth had mucous patches. Gond mothers suckle their children for three years. Mothers and sisters of infected children were seen with primary sores on the hips, or waist, due to their carrying children with condylomata.

3. There is a tendency for adults, who have not previously suffered from *koya*, to develop the primary sore if they live in huts which are occupied by or have recently been occupied by *koya* cases. These primary sores are generally found on the back, buttocks or thighs.

It is stated that more *koya* cases occur in the cold weather than at other seasons and this is due to persons sleeping close together for warmth.

The question of the disease being hereditary or congenital was inquired into. Every one of the *pedda dorras* definitely said that the mothers suffering from *koya* never have given birth to a child suffering from the disease, neither has the disease been conveyed by milk.

One of us (M. A. S.), who has seen over a thousand cases, heard of a case of a baby born with it, but the disease was not recognized until three months later. He did his best to collect similar cases but none could be found. It seems probable that the case was infected after birth.

Symptoms

The disease may be divided into four stages, and it is very interesting that the Koyas also divide the disease into four stages :—

Superficial infection, rheumatic infection, bone infection, and chronic ulceration of more than four years' duration. This classification though rough coincides with our stages, primary, secondary, tertiary, and para-tertiary.

The incubation period is from two weeks to three months. The disease lasts for weeks, months or years, its duration depending on general health. It is said that the younger the child, the quicker it recovers. Mild cases in the young and healthy recover in two months, but the average duration is two to three years. Those cases which last over four years reach the final stage and never recover. Many cases recover by themselves without treatment and only about one in three pass on to the final stage.

Primary sore

The primary sore appears as an isolated papule developing a few days later into an undermined ulcer with a raw base. It is usually seen at the angle of the mouth, anus, hands, wrists, elbows, legs, and is always extra-genital. It is in most cases very small and escapes detection. Among women it is seen on the nipples, breasts or waist. Among men at sites of injury. One Gond had it on the shoulder, due to his habit of carrying his infected child on his shoulders; the child had mucous patches near the anus. Another man had a scratch on the left pectoral region and developed an ulcer, later multiple papules developed around the margin. In this case the infection is said to be from the hut occupied by *koya* cases in which he stopped for a few days.

The appearance of the lesion is preceded by fever with rheumatic pains and malaise. This constitutional disturbance varies from a slight feeling of discomfort to severe rigors, high fever, persistent headache, and pains in the long bones and joints. The pains are worse at night.

Secondary eruptions

Secondary eruptions are preceded by similar constitutional disturbance and appear after a lapse of one to three months; first there is an urticarial rash with considerable itching and where the skin is broken by scratching, minute papules appear which increase in size, suppurate and form ulcers. The drying exudations make a scab or crust covering the ulcer forming a large mass. This when removed reveals the base of the ulcer with a typical pink raspberry appearance. The ulcer breaks down with desquamation and resembles a squamous syphilide. The 'syphilide' may be single or appear in groups. They are not formed on the mucous membranes but extension and growth are favoured by moist areas at the angles of the mouth, in the anal cleft and the inguinal region. The eruptions are of various types and continue to spread; while old ulcers heal new crops appear.

Some ulcers are of circinate type. The ulceration is unlike syphilis, is asymmetrical and is usually seen on exposed areas. The eruptions may be single or in clusters and at times confined to one extremity or one side of the chest or face. The tubercle may be flat, circular, irregular, raised or depressed. Big tubercles are surrounded by small ones and the size varies from one-third to one inch.

The formation of the papules in *koya* is attended with much itching but the ulcer is not at all sensitive. *Koya* patients have a distinctive and unpleasant smell.

The skin of the hands and feet becomes harsh and dry. No cases of adenitis were seen, nor alopecia, iritis nor the affections of the teeth. The clinical diagnosis from syphilis is not difficult.

Tertiary lesions.—Secondary ulcerations may disappear but in one-third of the cases ulceration extends giving rise to deep sores, with cicatricial contractions and infection of the bones. These deep ulcerations invade the bones of the limbs and face with crippling and disfigurement. These ulcers have shown no *Treponema pertenue*. It seems probable that the tertiary manifestations are no longer infective.

Para-tertiary affections.—Two cases of progressive paralysis with a history of *koya* lasting four years were seen.

Lesions of hands.—Cases with a scaly condition are not uncommon. The palms of the hands become rough and very irritable. Scales are seen with multiple fissures. Multiple dactylitis with swelling of phalanges and onychia occurs in the final stages. There may be loss

of pigment in healed areas resembling leucoderma.

Feet.—The scaly condition was also seen in the feet. In many cases the big toe was turned inwards. When a *koya* ulcer develops on the sole of the foot, in consequence of being bound down by the dense epidermis, it causes much suffering. When it spreads under the thick leathery and tough epidermis, it may attain a large size. This condition is known as the 'crab yaws'; it was seen only in three cases. In one the lesion was very painful and in the other two there was no pain, probably due to pressure being removed by the yaws fungating.

Face.—Deep ulcerations, especially of the forehead with necrosis of the frontal bone.

Bone.—Periostitis, osteitis and epiphysitis are common and many cases develop painful circumscribed nodules on the long bones. Cases with sabre-like tibia are common.

Pseudo-mycetoma.—Two cases were seen.

Ulceration of palate.—Nine cases were seen. The disease commences as an ulcer of the soft palate and gradually eats through the soft and hard palate.

Gangosa.—This usually starts with an ulcer at the root of the nose, or minute papules appear in clusters inside the nostrils. The ulceration spreads gradually and destroys the nose and upper lip. Two cases were seen.

Arthritis.—This is a common complaint and during the secondary stage several joints may be infected. In the tertiary stage, ankylosis is seen.

Other symptoms.—Anæmia is only seen in cases of long duration with multiple ulcers. The circulatory, respiratory and urinary system is normal. Enlarged spleens were seen, but were due to malaria and malarial parasites were found.

Locomotion is affected in the secondary stage. About one-third of the cases reach the tertiary stage and are mostly deformed.

Duration and mortality

The disease usually disappears during the primary and secondary stages. Tertiary signs may appear at any time after six months.

The mortality is small. Death is slow and is usually due to starvation after years of pain and disfigurement.

Working with mercury bismuth and salvarsan derivatives one of us (A. C. A.) obtained good results with arsenic and bismuth preparations but poor results with mercury.

It was found that cases with Kahn ++++ were still positive after one injection, even after 0.6 gramme, but the symptoms disappeared.

Over 100 cases were treated with salvarsan derivatives; a single dose of 0.15 gramme in a child, and a dose of 0.3 gramme of neo-salvarsan in an adult, brought about complete absence of

(Continued at foot of next page)

GASTRIC ANALYSIS IN ASTHMA

By L. EVERARD NAPIER, M.R.C.P. (Lond.)

and

DHARMENDRA, M.B., B.S.

(From the School of Tropical Medicine, Calcutta)

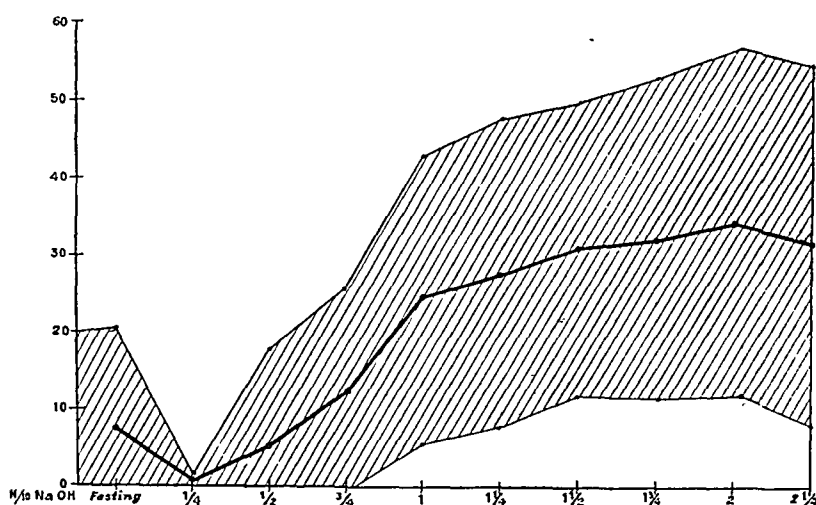
In a previous publication (Dharmendra and Napier, 1935) we reported the results of fractional gastric analyses in 30 cases of asthma. Amongst that series hypo-acidity was present in only 1 case, there was normal acidity in 15 cases, and hyper-acidity in 14 cases. The ages of the patients varied between 20 and 56 years. The results of fractional gastric analyses in another 38 cases of asthma are reported here. In this series achlorhydria was present in 2, hypochlorhydria in 3, normal acidity in 20 and hyperchlorhydria in 13 cases. This is shown in table I and figure 1 gives the mean readings and

TABLE I

Free hydrochloric acid values in 38 cases of asthma

	Highest value of free acid	Number of cases	Percentage of series
Achlorhydria ..	Nil	2	5.26
Hypochlorhydria	Under 15 units.	3	7.89
Low normal ..	Under 20 units.	4	10.52
Normal ..	25 to 50 units.	16	42.12
Hyperchlorhydria	55 to 115 units.	13	34.21

GRAPH



Free hydrochloric acid. Mean readings and standard deviations in 38 cases.

the standard deviations of these readings. The age incidence in this series was practically the same as in the last one, the ages varying between 15 and 55 years.

A comparison of the two sets of figures shows that in the present series there are 2 cases of achlorhydria while there were none previously,

(Continued from previous page)

symptoms in the primary, secondary and early tertiary stages.

We desire to express our grateful thanks to Colonel J. Norman Walker, C.I.E., I.M.S., Director, Medical and Public Health Departments, for his kind and sympathetic help and for the permission to publish this report.

the percentage of hypochlorhydria is greater, and the mean readings of free acid are lower than in the previous series. Oatmeal gruel was used as the test meal in both the series.

The results in both these series bear a marked contrast to the results obtained in cases of asthma by most other workers who report a much higher incidence of achlorhydria and hypochlorhydria (Maxwell, Hurst, Bray, Gillespie, etc.). As the values of free hydrochloric acid vary with age it is best to compare our results with those obtained from the same age group. The age incidence of 73 out of 109 cases reported by Gillespie (1935) is between 16 and 50 years. Of these 73 cases 33, i.e., 45.2 per cent, had low free acidity. Against this out of our 68 cases only 6, i.e., 8.8 per cent, had no or low free acid (table II).

TABLE II

Results of gastric analyses in 68 cases of asthma

	Number of cases	Percentage of series
Achlorhydria ..	2	2.94
Hypochlorhydria ..	4	5.88
Normal acidity ..	35	51.47
Hyperchlorhydria ..	27	39.71

Most of our cases belonged to the bronchitic, i.e., the non-allergic, type of asthma. This appears to be the cause of marked differences between our results and those of other workers, who mostly deal with the allergic cases.

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ABSTRACT OF A PAPER ON EXPERIMENTAL MALARIAL INFECTION OF *A. SUBPICTUS* GRASSI (*A. ROSSI* 'TYPE' GILES)

By C. STRICKLAND, M.A., M.D. (Cantab.)
and

D. N. ROY, M.D., D.T.M. (Cal.)
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THE above title covered a paper by Strickland and Roy (1936).

The authors in Calcutta compared the experimental malarial infection rate in *A. subpictus* Grassi (*A. rossi*) with that of *A. stephensi* and found that under conditions when 100 per cent of *A. stephensi* became infected, the infection in the former did not proceed beyond the zygote stage. It is noteworthy that these results were entirely different from those obtained by Walch and Soesilo (1929) and the point *inter alia* was suggested that they related to another 'race' of *A. subpictus*, a state of affairs reminiscent of the differential infectivity of the 'races' of the European *maculipennis*.

Nearly coincidentally with the authors' paper, one by Walch and Walch-Sordrager (1935) has appeared in which they have pointed out considerable differences between the eggs of the Indian and Malayan forms (see table).

TABLE

	Walch and Walch-Sordrager	Christophers and Barraud (1931)
	Differences between the eggs of <i>A. subpictus</i> in India and Java	
	average	average
Length ..	464.6 μ	660 μ
Greatest breadth ..	179.4 μ	210 μ
Number of ribs of float.	20.2	30-40
Length of float relative to total length.	0.53 μ	

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TWO CASES OF PYREXIA FROM
B. COLUMBENSIS

By T. H. THOMAS, M.D., M.R.C.P. (Lond.)

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and

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WITH the advancement of modern diagnostic methods the classification of many of the irregular and obscure fevers in India, the pyrexias of unknown origin are tending to disappear. The extended use of the Widal reaction, originally a diagnostic method for the enteric group alone, has certainly eliminated some of these.

Cases of fever caused by *Bact. columbensis* are presumably rare in this country, though Topley and Wilson in their book on Bacteriology and Castellani and Chalmers in their 'Tropical Medicine' have noted that *B. columbensis* produces a typhoid-like fever. It is possible that many of those fevers hitherto diagnosed clinically as belonging to the enteric group—such diagnosis being unsupported by positive serological and pathological tests—fall into the group of fevers now under consideration.

In two very interesting cases which have come under the observation of the present writers, the symptoms were suggestive rather of a *B. coli* infection of the urinary tract than of a fever of the enteric group. In both cases however it was possible to make a positive diagnosis of *B. columbensis* infection of the urinary tract, the bacteriological test being confirmed by an agglutination reaction against *B. columbensis* which is very similar to the para-typhoid group in its morphological characters and sugar reactions.

Case 1.—D. M., a girl, aged 7, was first isolated on 27th March, 1935, with fever.

A history of kala-azar in the year 1934 was given—this had been treated with six injections of neostibosan (four of 0.1 gm. and two of 0.2 gm.); a past history of measles and whooping cough was also given.

On admission to hospital the child had a temperature of 100°F. The only symptom was malaise. On

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It appears now therefore that sanitary inspectors and malaria surveyors may have to make their reports on the anopheline eggs of a locality rather than on the larvæ.

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examination she was found to have slightly enlarged, painful tonsils, a coated tongue, some tenderness below the right costal margin, and a slightly enlarged spleen on deep palpation.

The urine was turbid and offensive, contained an appreciable amount of albumin and a large number of pus cells. On the following day the temperature rose to 103.2°F. during the latter part of the morning, and thereafter rose daily reaching its highest point on the sixth day when it registered 103.8°F.; on the ninth day it started definitely to decline. The fever was irregular in type, on certain days definitely intermittent, on other days merely remitting, there was a range of from 3° to 4° between the highest and lowest temperatures recorded each day, occasionally the highest fever was in the morning and occasionally in the evening. It was invariably marked by a rapid ascent with slight shivering scarcely amounting to a rigor. (The temperature chart is annexed.)

The only symptom complained of during the whole course of the fever was slight pain in the left side of the abdomen. This started on 2nd April, 1935, and continued to the termination of the fever. It was easily relieved by sedative. On this day the urine was tested and was found to contain albumin and some acetone and pus cells.

part of the right side of the abdomen some years previously; this was accompanied by fever.

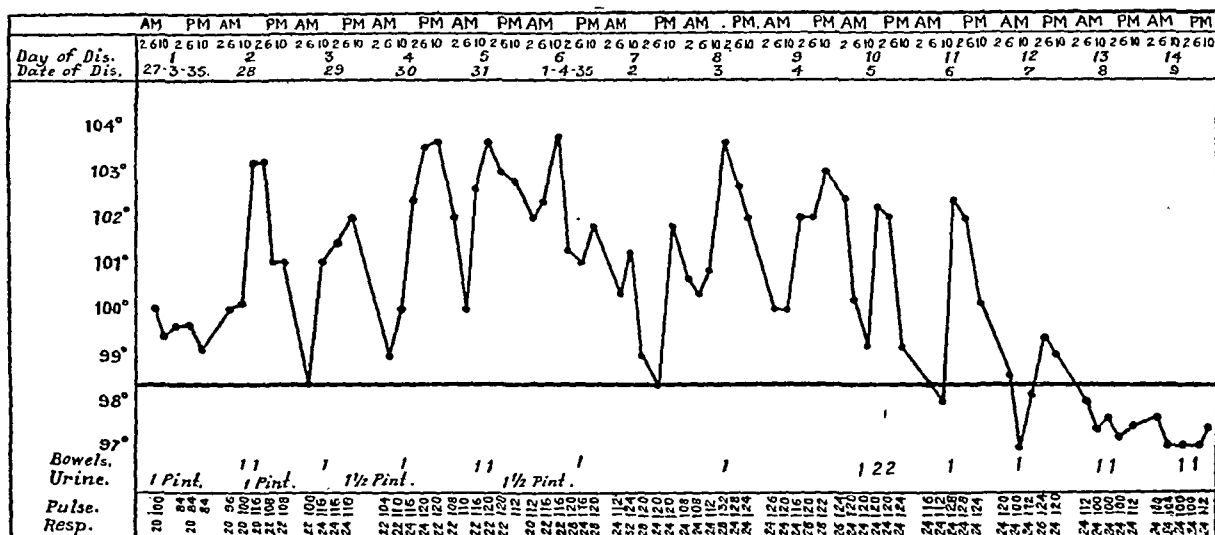
During the present attack the first rise of temperature recorded was 99.8°F. on 4th June, 1935, though the patient had been ill some days before admission. The onset of fever was attended with headache, a feeling of chilliness and some malaise. On examination the only sign was tenderness in both flanks; the tongue was thickly furred.

The urine on examination on the 7th of June was found to be turbid and offensive, albumin was markedly present. Pus cells were numerous on microscopic examination. On culture *B. columbensis* was found. The temperature reached its maximum 103.4°F. on the third day on which it was recorded (16th June). It began to decline on the 10th June, 1935. It reached no higher than 99°F. from 16th June (the thirteenth day) onwards and finally ceased altogether on the 21st June, 1935.

On 20th June complete examinations of the stool, urine and blood were made. The Widal test was negative to the enteric group, but positive to *B. columbensis* (1/250). There was an increase of small mononuclears in the blood; albumin was markedly present in the urine and pus cells were numerous. *B. columbensis* was found on culture as before. On 2nd July, Widal

CASE 1

Disease....Pyrexia. Age....7 years.



The temperature finally subsided on 8th April, 1935. On the 7th of April the blood was taken and tested for kala-azar. Chopra's and the aldehyde tests were both negative. The Widal test was negative to the whole enteric group but positive to *B. columbensis* (1/250). The urine at this time was offensive and cloudy and contained albumin and some pus but no acetone.

On 18th April, the stool was cultured and *B. columbensis* was isolated; agglutination reaction was positive against *B. columbensis*, isolated both from stool and urine, to higher dilutions (1/830), showing the increase in titre of the serum and thus confirming the recent infection of *B. columbensis*. The urine on examination at the same time was found to be almost the same as before. After treatment with autogenous vaccine of *B. columbensis* the urine on subsequent examinations was found to be free from pus cells, casts and also from bacteria.

Case 2.—M. M., a European lady, aged 52 years, fell sick on 18th June, 1935, complaining of frequency of micturition and dull pain in the right hypochondriac region.

She gave a history of a fall some months previously; this injury was followed by a short attack of fever. She gave also a history of colicky pain in the upper

test was found negative to *B. columbensis* in still higher dilutions (1/620).

The treatment carried out in this case was in the main similar to that of case 1, namely, autogenous vaccine of *B. columbensis* combined with the treatment generally applied in the case of *B. coli* infection.

Summary

In case 1.—*B. columbensis* was isolated both from the urine and the stool. Widal reaction was positive against *B. columbensis* on two occasions, with an increase in titre up to (1/830).

In case 2.—Although *B. columbensis* could not be isolated from the stool—it was isolated from the urine on each occasion. Widal reaction in this case was positive against *B. columbensis* in a titre rising to 1/620.

No blood cultures were made in either case as the investigation was undertaken somewhat late in the course of the disease.

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TREATMENT OF SYPHILIS BY MODENOL

By F. R. W. K. ALLEN, M.A., B.M.

MAJOR, I.M.S.

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THE vast majority of the population of the districts of Raipur and Drug are very poor and the funds available for the purchase of European medicines by the branch dispensaries are small. Syphilis is fairly common but it is quite impossible for the people to purchase or for the dispensaries to distribute free the neosalvarsan and intramuscular bismuth remedies, owing to the expense of these drugs.

The people are also very ignorant and even the well-to-do and well-educated classes neglect to follow medical advice and take a full course of anti-syphilitic treatment. The desire is merely for alleviation of symptoms.

It therefore appeared to me necessary to find a cheap substitute which would be more efficacious than mercury by mouth.

Being, in addition to my other duties, medical officer of the district jail, Raipur, I decided to try out the effect of modenol, which is a salicylate of arsenic and mercury, manufactured by Messrs. Merck and marketed by Messrs. Martin and Harris of Calcutta.

Modenol is put up in solution ready for injection in 2 c.cm. ampoules and is sold in two strengths. The cost works out at about 3 annas per ampoule and if two injections are given a week this comes much cheaper than treatment by neosalvarsan or sulfostab and bismuth, which even if purchased in bulk ampoules and bottles cost about 14 annas for a week's treatment. Furthermore, unless a large number of patients can be got to come at one time it is not possible to use the bulk ampoules of neosalvarsan and the cost of treatment is considerably enhanced whereas with modenol it makes no difference.

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In both cases treatment with autogenous vaccine appeared to benefit the patient. In case 1, repeated examinations of the urine showed a gradual disappearance of the pus, etc., and also of *B. columbensis* on culture.

The diagnosis appears to be a positive one of *B. columbensis* infection of the urinary tract.

We conclude that the original infections with *B. columbensis* probably existed in the gut and that there was an invasion of the urinary tract with the production of pyelitis subsequently. There appear to be some differences in these cases from infections with *B. columbensis* as hitherto described.

We are grateful to Dr. M. N. De, Professor of Pathology and Bacteriologist to the Government of Bengal, and Captain C. L. Pasricha, I.M.S., Professor of Bacteriology and Pathology, School of Tropical Medicine, Calcutta, for their help in confirming the pathological findings.

Selected convicts were given treatment with modenol. The conclusions to be drawn from this experiment are not decisive because it was impossible to regulate that only long-term prisoners would be syphilitics and many of the patients were released from jail before any definite results could be observed.

I have made a table of treatment of illustrative cases in the hope that it will stimulate a more complete and extensive investigation elsewhere. If, for instance, every alternate case of syphilis in the army could be treated with modenol or sulfostab and bismuth, conclusions could be drawn as to the merits of the two treatments relative to their expense, for it cannot be claimed that modenol is as good as neosalvarsan plus bismuth in the treatment of syphilis.

I do however believe that I have shown that symptoms can be relieved by modenol and that it is a useful drug for the treatment of those who cannot afford the more expensive, if better medicaments.

In treating cases with modenol I prefer to give the weaker solution for the first two injections. This is because patients sometimes suffer from considerable reactions with fever. After that males and average-size females will stand two injections a week of the strong solution. Small females and youthful cases should be given the weak solution or a reduced dose of the strong solution. Iron, quinine and strychnine are useful adjuvants and the patient's general health should be maintained by attention to oral hygiene and a generous mixed diet.

My experience of outpatients at the main hospital, Raipur, is that after about six injections symptoms are relieved to such an extent that patients cease to attend for further treatment. A few persons fail to return for the second or third injection because of the reaction after the first or second injection.

From the following table it will be seen that case 1 did not tolerate modenol well. That he was fairly resistant to treatment even with sulfarsenol for it took a long time for his blood Kahn test to become negative. At the same time whenever injections of sulfarsenol were stopped he tended to lose weight. Possibly it was the mercury in the modenol that disagreed with him. The lesson to be learnt from this case is that modenol does not agree with everyone but this is true of nearly every drug.

Case 3 responded very well to treatment and the condylomata seemed to disappear as quickly as in some other cases treated at more than twice the cost with sulfostab and bismuth. Of course length of time since infection was acquired would have to be taken into consideration in such cases and so it is not possible to generalize from the few seen. It was a very great pity that this man had to be transferred and his treatment interrupted just when his Kahn test was apparently becoming negative.

Case 5 did very well on modenol though it failed to keep his Kahn negative after six months' treatment. A short course of sulfostab and bismuth following the modenol rapidly gave him a negative Kahn but caused him to lose a little weight. His eczematous eruption was completely cured by the modenol.

Case 6 must be, I think, considered a great triumph for modenol for not only were clinical symptoms of three years' standing almost completely cured in a serious nerve infection but serologically both blood and cerebro-spinal fluid Kahn tests were made negative. This was done at a cost of under Rs. 6 for injections and it is at least doubtful whether at the equivalent cost eight weeks' treatment with sulfostab or neo-salvarsan and bismuth could have done as much.

Case 10 again demonstrates how clinical symptoms can be alleviated at small cost by modenol but shows that serological response in the cerebro-spinal fluid is rather slow. The subsequent course of sulfostab and bismuth however took six weeks to complete the turning of the Kahn to negative which had already been well completed in the blood by modenol so that in this case it may be unfair to blame modenol for the slow serological response in the cerebro-spinal fluid.

Case 14 demonstrates what can be done with only Rs. 2 worth of modenol.

Case 16 shows that in two weeks, after four injections of modenol costing annas 12, symptoms of two years' duration can be greatly alleviated. It also shows that sulfostab and bismuth were no more able to alter the serological reaction of the blood than modenol.

Case 27.—It is not certain that the splenic pain suffered by this man was syphilitic in origin. Modenol did however rapidly change Kahn test in his blood from +++ to negative. As is common in cases treated with the more expensive arsenicals the blood later became positive again when treatment had been stopped. The previous course of modenol seems to have made him sensitive to mercury, for a similar case of bad stomatitis has never been remarked after a single injection of modenol. The calciostab used is a preparation of calcium thiosulphate put up by Messrs. Boots in ampoule form and it is recommended for relief of arsenical and heavy metal reactions in patients.

Case 237 illustrates how six injections of modenol costing Re. 1-2-0 was able to change a completely paralysed and bed-ridden patient into a man capable of at least some form of locomotion on his own legs. The subsequent improvement on sulfostab and mercury by injection was not so spectacular but it was very gratifying. He did not like the reactions produced and for this reason treatment had to be suspended for a fortnight at the end of June.

TABLE

	Serological tests	Injection treatment	Adjuvant treatment	PROGRESS AND REMARKS
Case no. 1. Male, age 34. Infected 1922? No visible scars. On admission to jail in March 1931 he was found to have phimosis and since then he has suffered from severe bouts of intestinal colic. Bilateral enlargement of epitroclear glands.	12-2-34. Blood K. T. + + + 31-8-34. Blood K. T. — 16-11-34. Blood K. T. + 21-12-34. Blood K. T. + 16-2-34. C.S.F. K. T. + + 24-2-35. Blood K. T. + 22-3-35. Blood K. T. + 17-5-35. Blood K. T. + 8-6-35. Blood K. T. ± 12-6-35. C.S.F. K. T. + + 5-7-35. Blood K. T. — 6-7-35. C.S.F. K. T. + + 2-8-35. Blood K. T. — 3-8-35. C.S.F. K. T. + +	12-2-34 to 26-2-34. Five injections 2 c.c. modenol (strong). 7-3-34 to 16-3-34. Four injections. 18 ctg. sulfarsenol. 19-9-34 to 13-12-34. Ten injections. 2 c.c. modenol (strong). 21-1-35 to 9-2-35. Four injections 12 ctg. sulfarsenol. 18-2-35 to 4-3-35. Five injections 18 ctg. sulfarsenol. 21-3-35 to 18-4-35. Nine injections 18 ctg. sulfarsenol. 2-5-35 to 3-6-35. Eight injections 18 ctg. sulfarsenol. 20-6-35 to 1-8-35. Thirteen injections 20 ctg. sulfostab.	12-2-34 to 18-3-34. Pulv. hydr. ̄ cret. grs. 3 t.d.s. 22-11-34 to 6-12-34. Ferri sulph. grs. 4 Mag. " " 30 Quinine " " 2 Acid " dil. ʒ 10 Liq. strychn. (hydrochlor.) " 2 Water to oz. 1 1 oz., b.d. 18-2-35 to 5-3-35. Above mixture was repeated. 6-3-35 to 17-3-35. Pot. iodide grs. 3 Liq. arsenicalis ʒ 2 Tr. nux. vom. " 5 Water to oz. 1 1 oz., b.d. 18-3-35 to 8-8-35. Ferri sulph. grs. 12 Mag. " " 30 Quinine " " 2 Acid " dil. ʒ 10 Liq. strychn. " 4 Water to oz. 1	From 12-2-34 to 15-11-34. He improved greatly except for a set-back in October due to a malarial attack. No attacks of colic since February 1934. From 16-11-34 to 21-1-35. It was found that he was losing weight and so it was decided to stop modenol and try sulfarsenol instead. From 26-1-35 to 5-3-35. He improved greatly and gained 14 lbs. in weight. 6-3-35 to 18-3-35. Lost 8 lbs. in weight. 19-3-35 to 17-4-35. Gained weight slightly again. 18-4-35 to 27-6-35. Weight steady.

TABLE—*contd.*

	Serological tests	Injection treatment	Adjuvant treatment	PROGRESS AND REMARKS
	6-9-35. Blood K. T. — 7-9-35. C.S.F. K. T. + 4-10-35. Blood K. T. — 5-10-35. C.S.F. K. T. + +	Five injections 1 c.c. bis-mostab. 5-9-35 to 23-9-35. Six injections 20 ctg. sulfostab. Two injections 2 c.c. bismos-tab.		26-6-35 to 1-8-35. Grumbles but health is good. 1-8-35 to 2-9-35. Lost 6 pounds weight since injections were stopped on 1-8-35.
<i>Case no. 2.</i> Male, age 18. Infected 1932. Several scars on glans penis and in coronal sulcus. States he developed condylomata between thighs and around anus in October 1933 and secondary ulceration of penis with phimosis in December 1933. Seen after admission to jail on 8-10-34 and found to have extensive condylomata around anus and between thighs and scrotum. Also numerous patches of partially depigmented skin all over body.	8-10-34. Blood K. T. + + + 16-11-34. Blood K. T. — 23-11-34. Blood K. T. + +. 21-12-34. Blood K. T. ± On 16-1-35 he was transferred to another jail and treatment stopped. 11-3-35. Blood K. T. + + +	9-10-34 to 29-10-34. Six injections 2 c.c. modenol weak. 6-11-34 to 11-11-34. Two injections 2 c.c. modenol (strong). 3-12-34 to 14-1-35. Eleven injections 2 c.c. modenol (strong).	12-11-35 to 6-12-35. Pot. iodide .. grs. 5 Tr. nux. vom. ℥ 5 Liq. hydrarg. perchlor. " 20 Tr. ferri perchlor. " 20 Liq. arsenicalis hydrochlor. " 2 Water to oz. 1 1 oz., b.d.	By 1-11-34. The condylomata had commenced to shrivel and dry while the decolorized patches of skin had disappeared. By 12-11-34. The condylomata almost disappeared. On 20-12-34. There was no remaining trace of condylomata. On 1-10-35. He is reported to be without any obvious signs or symptoms of syphilis but his Kahn tests could not be obtained. It was a pity that this case could not have been kept under continuous treatment and observation.
<i>Case no. 5.</i> Male, age 25. Denies infection. Early in March 1934 was found to have eczematous eruption on dorsum of both hands and both feet.	18-3-34. Blood K. T. + + + 8-9-34. Blood K. T. — 16-11-34. Blood K. T. — 22-11-34. Blood K. T. + 5-1-35. Blood K. T. — 8-2-35. Blood K. T. ± 17-5-35. Blood K. T. + + 8-6-35. Blood K. T. ± 5-7-35. Blood K. T. — 6-7-35. C.S.F. K. T. — 2-8-35. Blood K. T. —	18-3-34 to 4-4-34. Four injections 2 c.c. modenol (strong). 26-10-34 to 11-11-34. Four injections 2 c.c. modenol (strong). 3-12-34 to 17-1-35. Twelve injections 2 c.c. modenol (strong). 14-2-35 to 21-3-35. Eight injections 2 c.c. modenol (strong). 8-4-35 to 3-6-35. Fifteen injections 2 c.c. modenol (strong). 20-6-35 to 1-8-35. Thirteen injections 20 ctg. sulfostab. Five injections 1 c.c. bismos-tab.	15-11-34 to 6-12-34. Pot. iodide .. grs. 5 Tr. nux. vom. ℥ 5 Liq. hydrarg. perchlor. " 20 Water to oz. 1 1 oz., b.d. 18-2-35 to 1-8-35. Ferri sulph. grs. 12 Mag. " " 30 Quinine " " 2 Acid " dil. ℥ 10 Liq. strych. " 4 Water to oz. 1 1 oz., b.d.	By 5-4-34. Eruption had disappeared. Has felt very fit and maintained his weight well above his physical equivalent until 14-7-34. 14-7-35 to 1-8-35. Lost 4 lbs. in weight. 3-8-35. Released.

Case 5 did very well on modenol though it failed to keep his Kahn negative after six months' treatment. A short course of sulfostab and bismuth following the modenol rapidly gave him a negative Kahn but caused him to lose a little weight. His eczematous eruption was completely cured by the modenol.

Case 6 must be, I think, considered a great triumph for modenol for not only were clinical symptoms of three years' standing almost completely cured in a serious nerve infection but serologically both blood and cerebro-spinal fluid Kahn tests were made negative. This was done at a cost of under Rs. 6 for injections and it is at least doubtful whether at the equivalent cost eight weeks' treatment with sulfostab or neo-salvarsan and bismuth could have done as much.

Case 10 again demonstrates how clinical symptoms can be alleviated at small cost by modenol but shows that serological response in the cerebro-spinal fluid is rather slow. The subsequent course of sulfostab and bismuth however took six weeks to complete the turning of the Kahn to negative which had already been well completed in the blood by modenol so that in this case it may be unfair to blame modenol for the slow serological response in the cerebro-spinal fluid.

Case 14 demonstrates what can be done with only Rs. 2 worth of modenol.

Case 16 shows that in two weeks, after four injections of modenol costing annas 12, symptoms of two years' duration can be greatly alleviated. It also shows that sulfostab and bismuth were no more able to alter the serological reaction of the blood than modenol.

Case 27.—It is not certain that the splenic pain suffered by this man was syphilitic in origin. Modenol did however rapidly change Kahn test in his blood from +++ to negative. As is common in cases treated with the more expensive arsenicals the blood later became positive again when treatment had been stopped. The previous course of modenol seems to have made him sensitive to mercury, for a similar case of bad stomatitis has never been remarked after a single injection of modenol. The calciostab used is a preparation of calcium thiosulphate put up by Messrs. Boots in ampoule form and it is recommended for relief of arsenical and heavy metal reactions in patients.

Case 237 illustrates how six injections of modenol costing Re. 1-2-0 was able to change a completely paralysed and bed-ridden patient into a man capable of at least some form of locomotion on his own legs. The subsequent improvement on sulfostab and mercury by injection was not so spectacular but it was very gratifying. He did not like the reactions produced and for this reason treatment had to be suspended for a fortnight at the end of June.

TABLE

	Serological tests	Injection treatment	Adjuvant treatment	PROGRESS AND REMARKS
Case no. 1. Male, age 34. Infected 1922? No visible scars. On admission to jail in March 1931 he was found to have phimosis and since then he has suffered from severe bouts of intestinal colic. Bilateral enlargement of epitroclear glands.	12-2-34. Blood K. T. + + + 31-8-34. Blood K. T. — 16-11-34. Blood K. T. + 21-12-34. Blood K. T. + 16-2-34. C.S.F. K. T. + + 24-2-35. Blood K. T. + 22-3-35. Blood K. T. + 17-5-35. Blood K. T. + 8-6-35. Blood K. T. ± 12-6-35. C.S.F. K. T. + + 5-7-35. Blood K. T. — 6-7-35. C.S.F. K. T. + + 2-8-35. Blood K. T. — 3-8-35. C.S.F. K. T. + +	12-2-34 to 26-2-34. Five injections 2 c.c. modenol (strong). 7-3-34 to 16-3-34. Four injections 18 ctg. sulfarsenol. 19-9-34 to 13-12-34. Ten injections 2 c.c. modenol (strong). 21-1-35 to 9-2-35. Four injections 12 ctg. sulfarsenol. 18-2-35 to 4-3-35. Five injections 18 ctg. sulfarsenol. 21-3-35 to 18-4-35. Nine injections 18 ctg. sulfarsenol. 2-5-35 to 3-6-35. Eight injections 18 ctg. sulfarsenol. 20-6-35 to 1-8-35. Thirteen injections 20 ctg. sulfostab.	12-2-34 to 18-3-34. Pulv. hydr. ̄ cret. grs. 3 t.d.s. 22-11-34 to 6-12-34. Ferri sulph. grs. 4 Mag. " " 30 Quinine " " 2 Acid " dil. ̄ 10 Liq. strych. (hydrochlor.) " 2 Water to oz. 1 1 oz., b.d. 18-2-35 to 5-3-35. Above mixture was repeated. 6-3-35 to 17-3-35. Pot. iodide grs. 3 Liq. arsenicalis ̄ 2 Tr. nux. vom. " 5 Water to oz. 1 1 oz., b.d. 18-3-35 to 8-8-35. Ferri sulph. grs. 12 Mag. " " 30 Quinine " " 2 Acid " dil. ̄ 10 Liq. strych. " 4 Water to oz. 1	From 12-2-34 to 15-11-34. He improved greatly except for a set-back in October due to a malarial attack. No attacks of colic since February 1934. From 16-11-34 to 21-1-35. It was found that he was losing weight and so it was decided to stop modenol and try sulfarsenol instead. From 26-1-35 to 5-3-35. He improved greatly and gained 14 lbs. in weight. 6-3-35 to 18-3-35. Lost 8 lbs. in weight. 19-3-35 to 17-4-35. Gained weight slightly again. 18-4-35 to 27-6-35. Weight steady.

TABLE—contd.

	Serological tests	Injection treatment	Adjuvant treatment	PROGRESS AND REMARKS
	6-9-35. Blood K. T. — 7-9-35. C.S.F. K. T. + 4-10-35. Blood K. T. — 5-10-35. C.S.F. K. T. + +	Five injections 1 c.c. bis- mostab. 5-9-35 to 23-9-35. Six injections 20 ctg. sul- fostab. Two injections 2 c.c. bismos- tab.		26-6-35 to 1-8-35. Grumbles but health is good. 1-8-35 to 2-9-35. Lost 6 pounds weight since injections were stopped on 1-8-35.
Case no. 2. Male, age 18. Infected 1932. Several scars on glans penis and in coronal sul- cus. States he developed con- dylomata bet- ween thighs and around anus in October 1933 and secondary ulceration of penis with phi- mosis in Decem- ber 1933. Seen after admission to jail on 8-10-34 and found to have extensive condy- lomata around anus and bet- ween thighs and scrotum. Also numerous patches of par- tially depig- mented skin all over body.	8-10-34. Blood K. T. + + + 16-11-34. Blood K. T. — 23-11-34. Blood K. T. + +. 21-12-34. Blood K. T. ± On 16-1-35 he was transferred to another jail and treatment stopped. 11-3-35. Blood K. T. + + +	9-10-34 to 29-10-34. Six injections 2 c.c. modenol weak. 6-11-34 to 11-11-34. Two injections 2 c.c. modenol (strong). 3-12-34 to 14-1-35. Eleven injections 2 c.c. modenol (strong).	12-11-35 to 6-12-35. Pot. iodide .. grs. 5 Tr. nux. vom. ℥ 5 Liq. hydrarg. perchlor. " 20 Tr. ferri perchlor. " 20 Liq. arsenicalis hydrochlor. " 2 Water to oz. 1 1 oz., b.d.	By 1-11-34. The con- dylomata had com- menced to shrivel and dry while the decolorized patches of skin had dis- appeared. By 12-11-34. The con- dylomata almost dis- appeared. On 20-12-34. There was no remaining trace of condylomata. On 1-10-35. He is re- ported to be without any obvious signs or symptoms of syphilis but his Kahn tests could not be obtained. It was a pity that this case could not have been kept under con- tinuous treatment and observation.
Case no. 5. Male, age 25. Denies infection. Early in March 1934 was found to have eczema- tous eruption on dorsum of both hands and both feet.	18-3-34. Blood K. T. + + + 8-9-34. Blood K. T. — 16-11-34. Blood K. T. — 22-11-34. Blood K. T. + 5-1-35. Blood K. T. — 8-2-35. Blood K. T. ± 17-5-35. Blood K. T. + + 8-6-35. Blood K. T. ± 5-7-35. Blood K. T. — 6-7-35. C.S.F. K. T. — 2-8-35. Blood K. T. —	18-3-34 to 4-4-34. Four injections 2 c.c. modenol (strong). 26-10-34 to 11-11-34 Four injections 2 c.c. modenol (strong). 3-12-34 to 17-1-35. Twelve injec- tions 2 c.c. m o d e n o l (strong). 14-2-35 to 21-3-35. Eight injections 2 c.c. modenol (strong). 8-4-35 to 3-6-35. Fifteen injec- tions 2 c.c. m o d e n o l (strong). 20-6-35 to 1-8-35. Thirteen injec- tions 20 ctg. sulfostab. Five injections 1 c.c. bismos- tab.	15-11-34 to 6-12-34. Pot. iodide .. grs. 5 Tr. nux. vom. ℥ 5 Liq. hydrarg. perchlor. " 20 Water to oz. 1 1 oz., b.d. 18-2-35 to 1-8-35. Ferri sulph. grs. 12 Mag. " " 30 Quinine " " 2 Acid " dil. ℥ 10 Liq. strych. " 4 Water to oz. 1 1 oz., b.d.	By 5-4-34. Eruption had disappeared. Has felt very fit and maintained his weight well above his physi- cal equivalent until 14-7-34. 14-7-35 to 1-8-35. Lost 4 lbs. in weight. 3-8-35. Released.

TABLE—contd.

	Serological tests	Injection treatment	Adjuvant treatment	PROGRESS AND REMARKS
<p><i>Case no. 6.</i></p> <p>Male, age 40. Infected 1925.</p> <p>Faint scars in coronal sulcus of penis.</p> <p>Admitted to jail on 20-8-35 and found to be suffering from spastic gait with bilateral drop foot. Unable to rise unaided from squatting position. Romberg's sign positive. Reflexes exaggerated. Complains of impotence, girdle pains, lightning pains in lower lumbar regions and legs, absence of perspiration below umbilicus, great constipation and inability to retain urine for more than an hour or so. The onset of these symptoms was gradual about three years ago.</p>	<p>23-8-34. Blood K. T. + +</p> <p>16-11-34. Blood K. T. —</p> <p>22-11-34. Blood K. T. —</p> <p>20-12-34. Blood K. T. —</p> <p>25-1-35. C.S.F. K. T. + +</p> <p>22-2-35. Blood K. T. +</p> <p>23-2-35. C.S.F. K. T. —</p> <p>3-3-35. Blood K. T. ±</p> <p>C.S.F. K. T. + +</p> <p>8-5-35. Blood K. T. —</p> <p>18-5-35. C.S.F. K. T. +</p> <p>8-6-35. Blood K. T. —</p> <p>12-6-35. C.S.F. K. T. —</p> <p>5-7-35. Blood K. T. —</p> <p>5-7-35. C.S.F. K. T. —</p>	<p>26-8-34 to 11-11-34. Nine injections 2 c.c. modenol (strong).</p> <p>3-12-34 to 17-1-35. Twelve injections 2 c.c. m o d e n o l (strong).</p> <p>14-2-35 to 18-3-35. Eight injections 2 c.c. modenol (strong).</p> <p>8-4-35 to 3-6-35. Fifteen injections 2 c.c. modenol (strong).</p>	<p>18-10-34 to 6-12-34. Syr. ferri iodide dr. 1 Pot. iodide grs. 3 Inf. quassia to oz. 1 1 oz., b.d.</p> <p>18-2-35 to 21-3-35. Ferri sulph. grs. 12 Mag. " " 30 Quinine " " 2 Acid " dil. m 10 Liq. strych. " 4 Water to oz. 1 1 oz., b.d.</p> <p>22-3-35 to 8-4-35. Pot. iodide grs. 4 Liq. arsenicalis m 2 Tr. nux. vom. " 5 Water to oz. 1 1 oz., b.d.</p> <p>9-4-35 to 27-6-35. Sulphate mixture as above.</p>	<p>1-11-34. Spasticity less. Pains less. Can rise unaided from squatting position.</p> <p>20-12-34. Spasticity much less. Constipation improving. Can hold urine longer.</p> <p>21-1-35. Girdle pains much less. Lightning pain gone. Can almost run. Micturition almost normal.</p> <p>4-2-35. States that he got great relief from spinal puncture on 25-1-35.</p> <p>14-2-35. Can now get a slight erection of the penis. Requests another spinal puncture.</p> <p>18-2-35. Walking gait almost normal. Can run awkwardly.</p> <p>5-3-35. Can run a little better.</p> <p>18-3-35. Micturition not quite normal yet.</p> <p>17-5-35. Slight weakness remains in left leg, but walking gait is almost normal. Spasticity is still evident when he runs. Left leg still does not perspire. Right leg has begun to perspire.</p> <p>4-6-35. Both legs now perspire. Only has to pass urine four times a day.</p> <p>27-6-35. Feels very fit. At rare intervals gets lightning pains for a second or so while walking.</p> <p>6-7-35. Released from jail. Promised to report progress after a month at main hospital, Raipur.</p> <p>4-10-35. Never reported at main hospital.</p>
<p><i>Case no. 10.</i></p> <p>Male, age 25. Infected 1925.</p> <p>Scar in coronal sulcus of penis. Seen on 15-10-34. Complains of continuous gastric pain unrelated to meal times.</p>	<p>15-10-34. Blood K. T. + +</p> <p>21-12-34. Blood K. T. —</p> <p>25-1-35. Blood K. T. + +</p> <p>22-2-35. Blood K. T. + +</p> <p>8-3-35. Blood K. T. +</p> <p>C.S.F. K. T. + +</p> <p>17-5-35. Blood K. T. +</p> <p>8-6-35. Blood K. T. —</p> <p>12-6-35. C.S.F. K. T. + +</p>	<p>15-10-34 to 19-11-34 Eight injections 2 c.c. modenol (strong).</p> <p>3-12-34 to 17-1-35. Twelve injections 2 c.c. modenol (strong).</p> <p>14-2-35 to 18-3-35. Eight injections 2 c.c. modenol (strong).</p> <p>8-4-35 to 3-6-35. Fifteen injections 2 c.c. modenol (strong).</p>	<p>15-10-34 to 6-12-34. Liq. hydrarg. perchlor. dr. 1 Pot. iodide grs. 10 Tr. card co. dr. 1 Aqua chloroformi. to oz. 1 1 oz., b.d.</p> <p>18-2-35 to 1-8-35. Mag. sulph. grs. 30 Ferri " " 12 Quinine " " 2 Acid " dil. m 10 Liq. strych. " 4 Water to oz. 1 1 oz., b.d.</p>	<p>15-11-34. Gastric pain much less.</p> <p>20-12-34. No gastric pain but has pain in chest.</p> <p>21-1-35. Feels very fit. No pains.</p> <p>17-5-35. Complains of spermatorrhœa for six weeks much worse during last two weeks.</p> <p>13-6-35. Spermatorrhœa less since a few showers of rain have fallen.</p> <p>27-6-35. Spermatorrhœa stopped with advent of monsoon.</p>

TABLE—*contd.*

	Serological tests	Injection treatment	Adjuvant treatment	PROGRESS AND REMARKS
	5-7-35. Blood K. T.— 6-7-35. C.S.F. K. T. + + 2-8-35. Blood K. T.— 3-8-35. C.S.F. K. T. + 6-9-35. Blood K. T.— 7-9-35. C.S.F. K. T.— 4-10-35. Blood K. T.— 5-10-35. C.S.F. K. T.—	20-6-35 to 1-8-35. Thirteen injections 20 ctg. sulfostab. Five injections 1 c.c. bismostab. 2-8-35 to 4-10-35. No treatment.		1-8-35. Lost 5 lbs. in weight during last two weeks. 3-10-35. Very fit.
<i>Case no. 14.</i> Male, age 30. Denies infection. No scars visible. Seen on 19-10-34 suffering from a deep dirty ulcer on the hard palate.	20-10-34. Blood K. T. + + + 7-12-34. Blood K. T. + +	20-10-34 to 20-12-34. Eleven injections 2 c.c. modenol (strong).		1-11-34. Ulcer healing. 15-11-34. Ulcer almost healed. 20-12-34. Ulcer quite healed leaving slight scar. 25-12-34. Released from jail.
<i>Case no. 16.</i> Male, age 42. Infected 1912? Three scars on prepuce. Seen on 23-10-34 complaining of indigestion for some time past, tingling and numbness of both legs especially marked in the soles of both feet on rising in the morning for past couple of years and great constipation.	From 28-10-34 to 7-9-35. Repeated K. T. on Blood and C.S.F. have been + + +.	31-10-34 to 8-6-35 Thirty injections 2 c.c. modenol (strong). 20-6-35 to 23-9-35. Fifteen injections 20 ctg. sulfostab. Six injections 1 c.c. bismostab.	15-11-34 to 2-12-34. Pulv. hydrarg. cret. . . grs. 3 b.d. 3-12-34 to 10-12-34. Tr. hyoscyamus. η 20 Tr. belladonna " 5 Water to oz. 1 1 oz., b.d. 18-12-34 to 26-6-35. Ferri sulph. grs. 12 Mag. " " 30 Quinine " " 2 Acid " dil. η 10 Liq. strych. " 4 Water to oz. 1 1 oz., b.d. 27-6-35 to 3-7-35. Infusion of senna daily 4-7-35 to 3-10-35. Sulphate mixture as above.	15-11-34. No tingling at all in right foot. Tingling only felt in left toes. 6-12-34. Constipation better. 20-12-34. No symptoms. 27-6-35. Due to constipation appetite is poor. 4-7-35. Bowels moving well.
<i>Case no. 27.</i> Male, age 28. Infected 1932. Circular scar round prepuce. On 18-2-35 complained of pain in spleen and of seminal emissions every second or third night. Spleen not palpable. No glandular enlargement.	16-2-35. Blood K. T. + + + 26-4-35. Blood K. T.— 8-5-35. Blood K. T.— 17-5-35. Blood K. T.— 28-6-35. Blood K. T.— 2-8-35. Blood K. T.— 6-9-35. Blood K. T. + + 7-9-35. C.S.F. K. T.— 13-9-35. Blood K. T. +	5-3-35 to 4-4-35. Nine injections 2 c.c. modenol (strong). 2-5-35 to 3-6-35. Eight injections 2 c.c. modenol (strong). 16-9-35. One injection 2 c.c. modenol (strong). 19-9-35. 2 c.c. calciostab. 20-9-35. 2 c.c. calciostab. 23-9-35. 2 c.c. calciostab.	18-2-35 to 18-3-35. Ferri sulph. grs. 12 Mag. " " 30 Quinine " " 2 Acid " dil. η 10 Liq. strych. " 4 Tr. belladonna " 30 Tr. hyoscyamus " 5 Water to oz. 1 1 oz., b.d. 19-3-35 to 16-5-35. Pot. iodide grs. 3 Tr. nux. vom. η 5 Liq. arsenicalis " 2 Water to oz. 1 1 oz., b.d. 17-5-35 to 27-6-35. Sulphate mixture as above less, belladonna and hyoscyamus was continued.	18-3-35. Seminal emissions have stopped. No pain in spleen. 18-9-35. Developed stomatitis probably due to injection of modenol on 16-9-35. Suffers from headache and feeling of prostration. 3-10-35. Stomatitis is much better, but patient has become very anæmic.

TABLE—concl'd.

	Serological tests	Injection treatment	Adjuvant treatment	PROGRESS AND REMARKS
<p>Main hospital, Raipur, case no. 237/1935.</p> <p>Male, age 25.</p> <p>Infected 1929.</p> <p>Scars on glans penis.</p> <p>First seen on 11-1-35 at branch dispensary, Mahasamund, suffering from spastic paraplegia of both legs, retention of urine and faeces and girdle pains. No sensory disturbances. Patellar and ankle clonus was present. Onset of symptoms was fairly rapid in November 1934.</p>	<p>25-5-35.</p> <p>Blood K. T. + + +</p> <p>27-7-35.</p> <p>Blood K. T. + +</p>	<p>11-1-35 to 28-2-35.</p> <p>Six injections</p> <p>2 c.c. modenol (strong).</p> <p>26-5-35 to 22-6-35.</p> <p>Eight injections totalling 1.35 grammes sulfostab.</p> <p>Five injections totalling 4 c.c. grey oil.</p> <p>9-7-35 to 6-8-35.</p> <p>Nine injections totalling 1.90 grammes sulfostab.</p> <p>Five injections of grey oil totalling 4.5 c.c.</p>	<p>26-5-35 to 5-6-35.</p> <p>Ferri et ammon. citras. grs. 5</p> <p>Liq. arsenicalis η 2</p> <p>Spt. chlorf. " 10</p> <p>Water to oz. 1</p> <p>1 oz., b.d.</p> <p>6-6-35 to 12-6-35.</p> <p>Sodii salicyl. grs. 10</p> <p>Sodii bicarb. " 10</p> <p>Liq. ammon. acet. dr. 2</p> <p>Spt. ammon. aromat. η 10</p> <p>Pot. iodide grs. 5</p> <p>Tr. nux. vom. η 5</p> <p>Water to oz. 1</p> <p>1 oz., t.d.s.</p> <p>13-6-35 to 26-6-35.</p> <p>Iron and arsenic mixture as above.</p> <p>27-6-35 to 6-8-35.</p> <p>Ferri sulph. grs. 10</p> <p>Mag. " " 30</p> <p>Quinine " " 2</p> <p>Acid " dil. η 10</p> <p>Liq. strych. " 5</p> <p>Water to oz. 1</p> <p>1 oz., b.d.</p>	<p>7-5-35. Seen by me in his village where he was able to walk with great difficulty by using a couple of crutches.</p> <p>21-5-35. Came to main hospital, Raipur. Could walk with great difficulty owing to spastic paresis of both legs, more marked in right leg.</p> <p>5-6-35. Can now walk with one stick only.</p> <p>6-6-35. Complained of burning pain all over body and stiffness of leg muscles.</p> <p>12-6-35. Legs no longer feel stiff.</p> <p>18-6-35. Can now manage to walk without a stick but prefers to use a stick. Spasticity still quite well marked at each step he takes.</p> <p>24-6-35. Complains of salivation and gingivitis.</p> <p>5-7-35. No gingivitis.</p> <p>9-8-35. Left hospital at his own request. He stated that he preferred the injections of modenol to the sulfostab because the latter gave him the sensation of stiffness in his leg muscles and he thought that after each injection the spasticity was worse again for a few days. He could walk haltingly without a stick and with a stick could make fair progress. Some spasticity remained.</p>

In all the above cases it may be argued that the dosage of sulfostab (Boots) or sulfarsenol (A. F. D. Co.) given as a contrast to modenol was much lower than the optimum recommended. It must however be remembered that the optimum dosage is based on the treatment of an average European male weighing approximately 140 pounds or more whereas the Chhattisgarhi hardly ever exceeds 120 pounds in weight. If the dose of sulfostab is increased so is the expense of treatment.

The bismuth preparation used was bismostab (Boots).

Conclusion

Nine cases of syphilis treated by modenol are reported. In one case modenol did not appear to suit the patient and sulfarsenol or sulfostab

had to be used. The remaining eight cases showed considerable improvement by modenol at a very small cost. In some cases the improvement was enhanced by subsequent treatment with sulfostab and bismuth or mercury by injection. It appears then safe to say that for people who cannot afford to buy the more expensive arsenicals plus bismuth for injection modenol offers an alternative treatment at a greatly reduced cost. It has the additional advantage for country practitioners and branch dispensaries that it contains both the arsenic and the heavy metal (mercury) all ready in solution in an ampoule for injection. Modenol is relatively cheap costing only annas 3 per ampoule. Two ampoules are needed each week for treatment. In serious cases treatment would

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THE EFFECT OF THE INGESTION OF VITAMIN C ON THE VITAMIN-C CONCENTRATION OF THE MILK OF LACTATING WOMEN

By R. K. CHAKRABORTY, M.Sc.

A. N. ROY

and

B. C. GUHA, Ph.D., D.Sc. (Lond.)

(From the Department of Biochemistry and Nutrition,
Indian Institute for Medical Research, Calcutta)

THE problem of infant nutrition is intimately connected with the nutritive quality of the mother's milk. Our earlier observations (1936) on the vitamin-C content of human milk indicated that the secretion of vitamin C in milk was connected with the nutritional level of the mother. It was considered of importance, therefore, to know how far ingested vitamin C would influence the secretion of vitamin C in milk. As it is known that ingested vitamin C is under certain circumstances largely eliminated in the urine, the problem of its partition when ingested by the mother, between the milk and urine, was taken up for investigation.

Normal Bengali mothers were taken as experimental subjects from two to six months after parturition. To restrict, as far as possible, the usual fluctuations in the output of the vitamin in milk and urine, the subjects were maintained during the period of experiment on ordinary Bengali diets, all cooked, and fresh fruits were rigidly avoided. The vitamin-C content of the morning urine and breast-milk was usually estimated for three days, keeping the subjects on the ordinary diets. From the fourth day onwards, different doses of orange juice, in which the amount of vitamin C had been previously estimated, was taken by the subjects between 10-30 and 11 p.m. just before going to bed and on the following morning their urine and milk were collected for the estimation of vitamin-C content. The estimations were carried out by the usual titrimetric technique with 2:6-dichlorophenol-indophenol with the modification of Ghosh and Guha (1935) and Chakraborty (1935). Eight cases were thus investigated. The results are given in the following table:—

(Continued from previous page)

probably need to be continued regularly for one or two years but very few Indian patients of the type envisaged would ever persevere to this extent.

Further controlled clinical tests are required to establish the exact value of the treatment when compared to neosalvarsan or sulfarsenol and its ultimate cost.

My thanks are due to Lieut.-Col. N. S. Jatar, D.S.O., I.M.S., Officiating Inspector-General of Prisons, Central Provinces, for permission to publish these results.

TABLE

	Amount of vitamin C taken in the previous night (approx. figure in mgm.)	Total volume of morning urine (in c.c.)	Amount of vitamin C per 10 c.c. of morning urine (in mgm.)	Amount of vitamin C per 10 c.c. of morning milk (in mgm.)
Case I	..	90	0.017	0.34
	23.4	95	0.017	0.40
	31.8	110	0.024	0.39
	31.8	200	0.028	0.44
	..	620	0.010	0.44
Case II	..	298	0.067	0.52
	..	466	0.027	0.47
	..	547	0.039	0.50
	41.1	473	0.050	0.49
	54.8	387	0.053	0.50
	68.5	508	0.050	0.53
	82.2	180	0.022	0.60
Case III	..	566	0.102	0.62
	..	435	0.037	0.24
	..	423	0.047	0.25
	54.8	415	0.038	0.23
	54.8	480	0.028	0.26
	68.5	440	0.062	0.26
	82.2	470	0.063	0.29
	109.0	715	0.042	0.36
	109.0	670	0.038	0.32
Case IV	..	502	0.050	0.39
	..	295	0.059	0.25
	..	167	0.121	0.31
	54.8	360	0.077	0.31
	68.1	303	0.067	0.32
	82.0	290	0.046	0.31
	95.2	290	0.068	0.37
	109.0	443	0.051	0.38
Case V	..	546	0.100	0.40
	..	350	0.034	0.29
	..	410	0.037	0.35
	..	673	0.025	0.35
	36.0	570	0.030	0.37
	65.0	886	0.025	0.35
	58.0	644	0.032	0.37
	84.5	910	0.033	0.36
	95.5	990	0.029	0.35
Case VI	..	103	0.269	0.36
	..	241	0.049	0.27
	..	203	0.077	0.28
	52.0	108	0.107	0.27
	52.0	336	0.064	0.27
	65.0	312	0.070	0.30
	65.0	366	0.062	0.29
	91.0	284	0.087	0.33
Case VII	109.0	348	0.075	0.35
	..	368	0.072	0.36
	..	385	0.016	0.25
	..	646	0.011	0.25
	54.8	402	0.025	0.25
	54.8	611	0.017	0.27
	82.0	665	0.026	0.30
	82.0	1,055	0.090	0.33
	109.0	678	0.203	0.33
	109.0	1,100	0.225	0.34
	..	615	0.518	0.37

TABLE—concl'd.

	Amount of vitamin C taken in the previous night (approx. figure in mgm.)	Total volume of urine (in c.c.)	Amount of vitamin C per 10 c.c. of morning urine (in mgm.)	Amount of vitamin C per 10 c.c. of morning milk (in mgm.)
Case VIII	..	433	0.033	0.25
	..	334	0.083	0.23
	54.8	226	0.087	0.24
	54.8	540	0.047	0.26
	82.0	385	0.067	0.28
	82.0	780	0.087	0.30
	109.0	657	0.333	0.34
	109.0	715	0.702	0.36
	..	664	0.893	0.38

Discussion

In the above experiments we fed orange juice as a source of vitamin C instead of the pure product because of the fact that from the standpoint of practical dietetics the feeding of orange juice was likely to give more useful results. It is possible, however, that the presence of other substances in orange juice might influence the partition of the vitamin between milk and urine. The results indicate, on the whole, in spite of the usual individual fluctuations, that the ingestion of orange juice increases the concentration of the vitamin in the milk significantly, the rise of the vitamin content in urine being relatively much greater. In several cases the concentration of vitamin C in the morning milk has been pushed to 1.5 times the usual value by the administration of 109 mgm. of the vitamin in orange juice. In these experiments, we have studied the concentration and not the total quantities of the vitamin in milk and urine, as it was not possible to collect the total quantities of milk and urine over twenty-four hours. Our results show that by feeding the mother with fairly large quantities of orange juice, it is possible to provide a larger supply of vitamin C to the baby, where the latter may not be fed with orange juice directly.

Summary

In a study of eight cases of normal healthy Bengali mothers it has been found that the administration of fairly large quantities of orange juice increases the concentration of vitamin C in milk appreciably, while the excretion of the vitamin in urine also increases very considerably. The significance of this observation in connection with infant nutrition is discussed.

[Note.—The absolute increase in the milk is small although relatively it amounts in one case to a 50 per cent rise above the normal. As the total milk was not collected over the twenty-four hours it cannot be said definitely whether the increase would be significant in the economy of the child. The results show,

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A NOTE ON THE USE OF CYANOGENAS 'A' DUST AS A RATICIDE AND PULICIDE

By M. YACOB, M.B., B.S., D.P.H., D.B., D.P.H., D.T.M. & H.
Epidemiologist to Government, Punjab

A SERIES of experiments was undertaken with cyanogas 'A' dust in the Punjab Epidemiological Bureau with a view to ascertaining its value as a raticide and pulicide, and gaining an idea as to the staff required and the practical difficulties which they would have to encounter in the field, in case it was decided to adopt this method of destroying rats and rat fleas in plague-infected villages, in lieu of or as an auxiliary to *bhoosa-battis*.

The experiments were conducted in artificial and natural rat holes in the fields and also in houses. As natural rat holes do not always contain rats the ordinary house rat was introduced into a few of them and cyanogas 'A' dust used. The equipment used consisted of:—

1. Cyanogas 'A' dust in air-tight tins.
2. Cyanogas large foot-pump.
3. Cyanogas small foot-pump.

Experiment I.—An artificial rat hole 20 feet long was dug in the form of a trench wide enough to allow a rat to move about easily, with a side trench $4\frac{1}{2}$ feet long in the middle, as shown in the accompanying diagram. The hole was covered over with pieces of tin-foil over which dry earth was put to imitate as far as possible a natural rat hole. Before roofing over the trench rats with cords tied to their tails were introduced into the trench at distances of 5, 10, 15 and 20 feet respectively from the opening. The other ends of the cords were placed under heavy weights so that the positions of the rats in the trench might remain fixed. Similarly, a rat was placed at the other end of the side trench. The trench was then closed except one end to serve as an opening to the rat hole. The reservoir of the large hand-pump having been filled with the 'dust', its nozzle was introduced into the rat hole and five full strokes were given. Any places from where the gas leaked as shown by the appearance of a white cloud were immediately closed with wet clay. The trench was dug up after an interval of five minutes. The rat at 5 feet was dead, the others were unaffected.

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however, that there might be distinct possibilities of increasing the supply of vitamin C to the infant where direct feeding of orange juice is not possible.—
EDITOR, I. M. G.]

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Experiment II.—The period of exposure was increased to ten minutes.

Results : Same as in experiment I.

Experiment III.—The period was increased to fifteen minutes.

Results : Same as in experiment I.

Experiments IV, V and VI.—The period of exposure was reduced to 4, 3 and 2 minutes, respectively.

Results : Same as in experiment I.

Experiment VII.—The period was reduced to one minute.

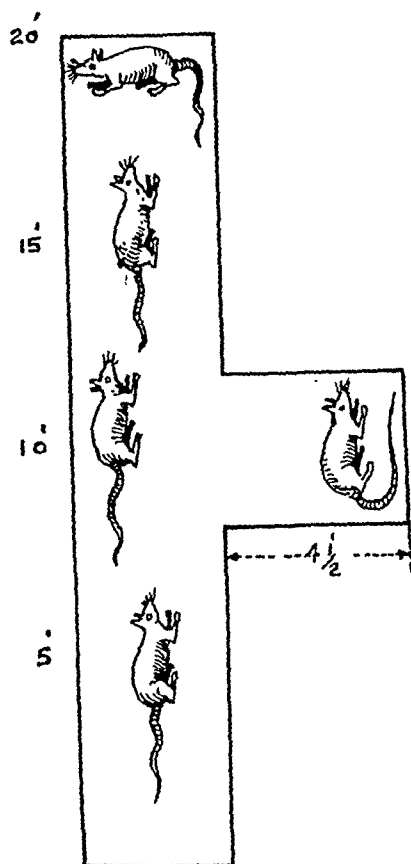


Diagram showing the position of rats in the artificial rat hole.

The rat at 5 feet was still breathing, although unconscious. Died after five minutes; the others were unaffected.

As a result of these trials it was concluded that the minimum period of exposure required was two minutes.

Experiment VIII.—The number of strokes with the large foot-pump was increased to ten, the period of exposure remaining only two minutes. The rats at 5 and 10 feet were both dead; the others were unaffected.

Experiment IX.—The number of strokes was increased to 15, the period of exposure remaining unaltered. The rats at 5, 10 and 15 feet were all dead and the rat in the side trench was unconscious and died shortly after.

Experiment X.—The number of strokes was increased to 20, the period of exposure remaining unaltered.

Results : Same as in experiment IX.

This experiment was repeated a number of times and the period of exposure was gradually increased from 2 to 5, 10 and 15 minutes. The results were invariably the same, thus indicating that increasing the number of strokes beyond 15 does not correspondingly increase the effective lethal range of the gas, which extends only up to 15 feet, and that no apparent difference is made by increasing the time factor beyond two minutes.

The experiments were then repeated with rat fleas contained in muslin bags and placed at distances of 5, 10, 15 and 20 feet respectively. An additional bag was placed at the end of the side trench. The results were almost the same as those obtained with rats. The fleas were killed in 2 minutes up to a maximum distance of 15 feet.

The small hand-pump was also tried and it was found that, on an average, double the number of strokes was required. Experiments were also undertaken in natural rat holes in *kacha* houses under rural conditions. The results were equally satisfactory.

Comparison of cyanogas with bhoosa-battis

1. Experiments previously carried out with *bhoosa-battis** in the Bureau indicated that the lethal range of the smoke did not extend beyond 10 feet for the rats and 5 feet for the rat fleas, respectively. Whereas with cyanogas the range of destruction is comparatively more extensive as it is capable of destroying both the rats and the fleas at a distance of 15 feet from the mouth of the rat hole.

2. About one-eighth of all the *bhoosa-battis* soon become extinguished after the rat holes are closed with mud and consequently fail to destroy the inmates of those holes. There is no such difficulty in the case of cyanogas.

3. The price of cyanogas 'A' dust as quoted by Messrs. Shaw Wallace & Co. of Calcutta is Re. 1-8 per pound, and, as on an average one rat hole does not require more than 1 ounce of the dust, the cost per hole works out at $1\frac{1}{2}$ annas, whereas the cost of a *bhoosa-batti* as supplied by the Public Health Equipment Depot, Jullundur City, is about 2 pice.

4. An initial outlay for the cyanogas pumps—the large foot-pump costs Rs. 30 and the small one Rs. 20—however, has to be made which is not required in the case of *bhoosa-battis*.

5. *Bhoosa-battis* are comparatively harmless to human beings but considerable care has to

* *Bhoosa-battis* are a modification of Lane's *Neem battis* and are extensively used in the Punjab as an anti-plague measure for smoking out rat holes. The ingredients of a *bhoosa-batti* are as follows:—

Potassium chlorate 2 drachms, sulphur 2 drachms, potassium nitrate $1\frac{1}{2}$ drachms, red pepper 1 drachm, mustard oil 4 drachms, *bhoosa* q.s., wastepaper q.s., *khaddar* cloth 6" × 6" and wick 3" × 1".

be exercised in the use of cyanogas. The adjoining rooms and houses where the dusting is going on have to be evacuated and all holes, etc., from which the dust may escape have to be stopped immediately with wet clay. With ordinary precautions and in the hands of a well-trained staff, however, cyanogas should not be a source of danger, because (i) the diffusion power of hydrocyanic acid being very poor, little of the gas escapes out of the hole into which the dust has been pumped, (ii) with the doors left open only a small concentration of hydrocyanic acid gas is attained in the air of the room, and (iii) after 2 hours of free communication between the air of the room and the atmospheric air only a slight trace of the gas is left in the room.

6. A more competent staff is required for the use of cyanogas than for *bhoosa-battis*.

7. The pumps are liable frequently to get out of order, and, therefore, the supervisor or mate must be able to carry out minor repairs for himself so as to keep the equipment in an efficient working order.

8. The work done by plague gangs using *bhoosa-battis* can be checked by the inspecting officer by opening up a certain number of rat holes when the charred remains of the *battis* can be found. This cannot be done in the case of cyanogas.

The following recommendations are made regarding the use of cyanogas 'A' dust as a raticide and pulicide:—

1. Staff required:—

A gang or sanitary section to consist of:—

Mate	..	..	1
Coolies	..	..	3
Total	..	..	4

One man to handle the machine, with a spare man to alternate with him from time to time. Two men for preparing and carrying wet clay or mud and for filling holes.

2. Equipment required:—

Cyanogas 'A' dust in an air-tight container.

Cyanogas foot-pumps large—two, each fitted with tubing 6 feet long.

Each group to be equipped with two machines, the spare man to keep the second machine filled so that there is no pause in the work.

In addition to the above the following will also be required:—

Tools for repairing pumps	..	1 set
Wooden spoon for putting the dust into the pumps	..	1
Taslas or karahis for carrying wet clay	..	2
Spade for digging earth for mud	..	1
Bull's-eye lantern for searching for holes in dark rooms	..	1

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A NOTE ON MUSEUM MAKING

III

A METHOD FOR PRESERVING AND MOUNTING PATHOLOGICAL FLUIDS

By P. V. GHARPURE, M.D., D.T.M. & H.

(From the Pathology School, Grant Medical College, Bombay)

THE following method has been found by me very useful in preserving material such as gastric contents, fluids from serous sacs, urines, chylous fluids, etc.:—

1. The material should be collected in sterile and stoppered bottles in which about 1 c.cm. of toluol has been kept.

2. It should be shaken up well to prevent clotting.

3. A small funnel four inches in diameter should be fitted on a ring on a stand. The funnel should be loose packed with cotton-wool. This wool should then be soaked in toluol till drops come through the stem of the funnel.

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3. Before starting work the rooms must be completely evacuated and all live stock and pet animals kept out. All rooms connected with this room also must be evacuated, and all furniture, etc., removed to the centre of the room which is to be systematically explored for the presence of rat holes. Before working, the coolies must be ready with wet clay or mud. The operator with the pump charged with the dust should insert the nozzle into a rat hole and the coolies close up the hole around with mud. The operator should then give 15 good deliberate strokes by working the pump. The coolies must be on the alert to close up with mud all holes from which the dust escapes. It is important to ensure that all holes from which the dust emerges are properly and effectually blocked.

4. Adjacent rooms and houses to be carefully watched and any holes from which the dust escapes must be immediately closed with mud.

5. One operator on an average can dust 12 to 15 holes per hour provided that people help the gang in removing the household effects from the rooms.

6. The doors of the rooms must be kept open throughout.

7. The house or room can be occupied after two hours' ventilation.

8. The operator and coolies should wash their hands after finishing the work and before taking their meals.

9. No open wounds or sores should be present on the bodies of the workers lest the hydrocyanic acid be absorbed.

4. The material to be preserved should then be allowed to pass through the wool soaked in toluol in the funnel.

5. The 'filtrate' is collected in a beaker.

6. Special ampoules of appropriate size and shape should be prepared from glass tubing. These should have long necks. They should be rinsed with toluol and the material to be

preserved put in by a pipette. A layer of toluol will float. This should be pipetted off. The ampoule should be filled as far as possible, and sealed.

I have in my possession chylous urines, gastric contents of carcinoma stomach, etc., prepared by the above method, unchanged for nearly five years.

A Mirror of Hospital Practice

HYDROPHOBIA SIMULATING ACUTE TRANSVERSE MYELITIS AT THE ONSET

By A. C. ROY

Charitable Dispensary, Balagaria, Midnapore

ON the 11th October, 1935, I was called to see a child, aged about 11 years. He had the following symptoms:—

- (1) Fever—duration 2½ days.
- (2) Retention of urine—24 hours.
- (3) Inability to move the legs—12 hours.

Case history.—The child was taken ill on the evening of the 8th October; he complained of pain over upper part of his body. He was treated with homœopathic remedies for two days and on the 10th October, as he had not passed any urine for a long time, he was given some medicine internally and he passed a small quantity of urine. The same evening he felt heaviness of the legs and shortly afterwards found he could not move them.

He was seen by me in the morning of the 11th October and the following points were noticed:

- (1) Temperature—100.5°F.
- (2) Pulse rate—145 per minute, volume and tension—fair.
- (3) Bladder full—up to umbilicus.
- (4) Paralysis of both legs. There was no pain and all sensation including heat or cold sense up to the level of the umbilicus was lost.
- (5) Bowels had not moved for 2 days.
- (6) Tongue dry and clean.

Nothing else abnormal was detected.

The provisional diagnosis of acute transverse myelitis was made.

On the application of hot-water bottles he passed about 2 ounces of urine but the bladder, being still distended, it was relieved by a catheter. A glycerine suppository was also given but without effect. He was given urotropine and tincture digitalis internally and the bladder was relieved at regular intervals.

12th October. The condition was unchanged and a movement of the bowels was effected by a dose of castor oil.

About eleven o'clock the same evening it was noticed that the boy would not take any water or food; he refused everything and was somewhat restless.

12th October. I went to see the boy again about 2 a.m. and at that time he had a temperature of 101°F. Pulse rate—145 per minute, volume and tension fair, wrist drop had now developed. His tongue was dry and he was very restless but fully conscious.

He made a peculiar grimace as soon as a glass of water was brought in front of his eyes and he was asked to drink. There was spasm of the muscles of the face and neck. This was repeated several times and every time he did the same thing. On asking him to drink some water without showing him the glass he simply said 'No' and there was no spasm. Some difficulty of speech was also noticed.

The symptoms suggested hydrophobia and on enquiry the parents gave the history of a dog-bite

about 8 months back and that three boys were bitten by the same dog. The dog was lost sight of two days after the bite. The boy did not undergo antirabic treatment and the wound was not even cauterized.

This made the diagnosis clear.

At 7 a.m. on the 13th of October it was noticed by the relatives that the hands were now completely paralysed. The patient did not now object to take water of which a small quantity was given.

The child died at about 11 a.m.

I have since been informed that another boy who was bitten by the same dog had already died two months ago and he had also had paralysees of the limbs. The full history of this case could not be elicited.

A CASE OF UTERUS BICORNIS WITH ADVANCED PREGNANCY COMPLICATED BY A LARGE PELVIC CYST

By G. M. IRVINE, M.D., F.R.C.S.E.

MAJOR, I.M.S.

Civil Surgeon, Bassein, Burma

THE case given below presents features sufficiently unusual to warrant its publication:

M. T. S., aged 25, was admitted on 25th June, 1935, complaining of abdominal pain.

History.—The patient was married one year, and stated that she had had amenorrhœa for seven months. She stated that she had been in normal health until three days previously. Since then she had been suffering from abdominal pain which she refers to the uterus. During that time she had also had dysuria with scanty burning micturition. Apart from the pain and dysuria her health was good. No history of pyrexia. Pulse 90 per minute. Temperature 98.8°F.

Examination.—On examination a uterus corresponding to the size of a seven months' pregnancy was found. It was noted that this was definitely displaced towards the right side of the abdomen with the fundus reaching the margin of the ribs in the right hypochondrium. It was not possible to displace the uterus towards the middle line. The fetal outlines were vaguely felt and a small fetal head could be defined lying high in the abdomen well above the pelvic brim, and displaced to the right of the middle line. The uterus was somewhat tender on palpation. No contractions were observed.

On vaginal examination a large cystic tumour was found very low down in the pelvis on the left side. On inserting a speculum the tumour, covered by the stretched out mucous membrane of the left lateral fornix and adjacent vaginal wall, was found to protrude downwards and practically presented into the vulva. The right fornix was converted into a deep narrow recess the limits of which could just be reached. In this recess the opening of the os could be identified with some difficulty as a crescentic slit running roughly antero-posteriorly and in close relation to the right

margin of the tumour. The impression was gained that the tumour had arisen actually in the substance of, or close to, the cervix and that this was tightly stretched out over it as it grew, rather than displaced bodily.

There was retention of urine and the bladder was evacuated by catheter.

A diagnosis of pregnancy in conjunction with a pelvic (? broad ligament) cyst, which constituted a complete obstruction to delivery, was made and immediate Cæsarean section decided on.

Operation

On opening the abdomen an almost complete 'double uterus', or uterus bicornis was recognized. The right half contained a seven months' fœtus. The left half, except that it had only one cornu and attached tube, was about the shape of and slightly larger than a normal uterus.

Cæsarean section by the 'classical' method was done and a living fœtus delivered. Although the placenta was situated on the anterior wall subjacent to the line of the incision, very little blood was lost. The uterine incision was closed.

The pelvis was then explored. A large cystic tumour was found deep in the right side of the pelvis. It was about the size of a small foetal head and the walls were somewhat flaccid. It was found to be situated below the uteri and bladder which it was displacing bodily upwards. It also lay completely below the base of the left tube and broad ligament, the leaves of which were not expanded in the manner usual with a broad ligament cyst.

Its removal obviously presented great technical difficulties and it was decided *faute de mieux* to aspirate it. This was done by means of a large-bore trocar and rubber tube the trocar being inserted just in front of the bifurcation of the uteri and behind the posterior limit of the bladder which was carefully identified. It was then found that the cyst was infected and instead of the usual clear contents contained a couple of pints of thick foul-smelling pus. This of course was likely to prove a disastrous feature for the patient, as it was not possible to prevent the general abdominal cavity from being extensively contaminated with the infected fluid in the process of evacuation. Finally it was explored with the finger and found to be a large cavity with quite smooth walls thus indicating that the tumour was a true cyst which had become secondarily infected and not a primary abscess.

A tube was inserted into the cavity, the patient sterilized by tying off and excising portions of the tubes, and the abdomen closed. The general condition of the patient after the operation was excellent.

Subsequent course

By the following day it was apparent that general peritonitis was developing. She complained of pain in the abdomen which became distended and tympanic; temperature 102.6°F.; pulse rate rose from 120 to 140 and soon became thready in character. Intravenous salines and glucose (10 per cent) pituitrin and turpentine enemata were given with only temporary relief. The general condition became steadily worse and she died of general peritonitis on the fourth day after operation.

Comment

As regards the congenital abnormality of the uterus this is a very complete example of uterus bicornis unicollis. Fusion of the Mullerian ducts has taken place only in its lower segment, i.e., the portion which represented the developing vagina and cervix. The segment above this destined to become the body of the uterus has completely failed to fuse, with the result that there were two complete uterine bodies the cavities of which opened into a common cervical

canal. The remarkable development of both the organs was also noticeable. The pregnant half was exactly like any other pregnant uterus and the non-pregnant half was indistinguishable from a slightly enlarged normal uterus except that it had only one cornu and tube.

There is no reason why this particular developmental abnormality should give rise to any obstetrical difficulty and it is probable that in most cases labour does not differ from the normal and the condition is never suspected. In the case under report in all probability it would never have come under observation were it not for the fact that labour was obstructed by a pelvic tumour.

As regards the cyst which caused the obstruction in this case, this is situated in an unusual position. It appears probable that it has arisen from an unobliterated segment of Gaertner's duct. This is the remains of the Wolffian system and it is from the developmental remnants of this that most of the cystic tumours in the region arise. Those arising from the cephalic end which is represented by the epophoron and paroophoron and upper end of Gaertner's duct include the majority of broad ligament cysts while the caudal portion, i.e., the lower end of Gaertner's duct, gives rise to the rarer vaginal cysts. The tumour in question is situated in a position midway between the two. It had apparently arisen in close relation to the cervix which gave the impression on examination of being incorporated in the actual wall of the tumour, marked distortion and displacement of the os being produced thereby.

Another peculiar feature of the case was the fact that the contents of the cyst were purulent without any history or symptoms to suggest an inflammatory condition. The tumour though containing frank *B. coli* pus was quite painless and showed no tenderness whatever on palpation.

The patient gave no history of fever prior to admission nor was any pyrexia observed in hospital before operation. There was in fact nothing whatever to suggest infection.

Had this been suspected at the time of operation a simple Cæsarean section would have been done and the abdomen closed without interfering with the tumour. This could have been dealt with at leisure later, by drainage through the vaginal fornix; the disaster resulting from contamination of the peritoneal cavity and the subsequent fatal peritonitis would thus have been avoided. Exploratory punctures of the tumour through the fornix was considered originally but rejected as there was no evidence whatever to point to the possibility of infection.

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The army has recently bestowed a similar benefit in the realms of animal parasitology by drawing attention to the relatively great prevalence of cysticercosis in human beings caused by *Cysticercosis cellulosæ*, the larval or bladder stage of *Tænia solium*. As long ago as 1786 the systemic infection of human beings with this parasite was recognized and it was given its present name in 1809. That great English parasitologist, Cobbold, in 1864 gave a classical description of cysticercosis of the brain caused by *C. cellulosæ*. From this brief historical outline it is clear that the disease is not by any means a new one, but since the days of its discovery it has been looked upon more or less as an interesting curiosity on account of its apparent rarity. MacArthur about six or seven years ago began to notice that epilepsy in British troops at the Queen Alexandra Military Hospital, Millbank, London, seemed to be often associated with cysticercosis of the brain. The lead given by this observer was immediately followed up by other workers, notably Dixon and Smithers, and up to the present two hundred and fifty-eight cases of epilepsy in the army in England have been investigated and of these seventy-nine have been definitely proved to be due to cysticercosis, and an additional forty are considered doubtfully due to the same cause. Records of similar conditions are beginning to appear in many parts of the world so it is evident that the importance of *T. solium* infection and its corollary cysticercosis has been somewhat underrated up to the present.

Our readers may wonder what all this has to do with India in particular, but when it is noted that seventy of the above seventy-nine patients have been in India for some period of their lives and that, from the evidence available, the majority of them appear to have been infected in this country the gravity of the condition to India is clear.

There are certain surprising circumstances in the facts brought to light in the course of this

investigation, one of the chief being that not yet, as far as we are aware, have any cases of cysticercosis in man been reported among the civil population in India, whether they be foreigners or indigenous, as a result of this work. But this disease is not altogether unknown in India for twenty-five years ago in the columns of this journal both systemic and cerebral cysticercosis were recorded in Madras, and ten years later a few more instances of eye and brain cysticercosis were reported from the same city. In respect of the indigenous population the great majority are prevented from becoming infected on account of their religious prohibitions regarding the consumption of pork, but these restrictions do not apply to foreigners and certain low-caste indigenous tribes. Meat inspection to a certain extent protects the dwellers in the larger cities, but by far the greater number of pigs are killed and eaten in small towns and villages where meat inspection is quite inadequate or entirely absent, so that the opportunities of infected meat being made available for human consumption must be very numerous. It is accordingly surprising that the records of human infection either with the adult worm or the larval stage are so few.

We learn from a private source that *C. cellulosæ* infection in pigs slaughtered in Calcutta is fairly common and the meat is condemned. From this it is evident that the records of *T. solium* infection in India must be very incomplete, for the only possible source of pig infection is the stools of human beings. The apparent rarity of *T. solium* infection in India is probably explained by the fact that the pig keepers and pork eaters are for the most part low-caste individuals living in the country districts and hence not likely to come into contact with medical men to any extent, so that many of them probably carry the infection for years without the knowledge of its existence extending beyond the village in which they live.

As an instance of the difficulty in arriving at the incidence of tape-worm infection in a community the recent example from the state of Victoria in Australia is instructive. As the result of a considerable amount of *Cysticercus bovis* being found in beef on sale it was decided to carry out a survey to ascertain the amount of infection present in the population. Although the hospital records only showed five cases in the last ten years a carefully planned inquiry brought ninety cases to light in the period from January 1933 to July 1935. When it is realized that the population of Victoria at the time of the inquiry was only 1,830,000 and that practically all the people are literate with fairly easy access to medical advice, and that sanitation is on the whole on a high grade, it is clear that tape-worm infection in India whether it be with *T. solium* or *T. saginata* must be very common in certain districts and among certain castes.

margin of the tumour. The impression was gained that the tumour had arisen actually in the substance of, or close to, the cervix and that this was tightly stretched out over it as it grew, rather than displaced bodily.

There was retention of urine and the bladder was evacuated by catheter.

A diagnosis of pregnancy in conjunction with a pelvic (? broad ligament) cyst, which constituted a complete obstruction to delivery, was made and immediate Cæsarean section decided on.

Operation

On opening the abdomen an almost complete 'double uterus' or uterus bicornis was recognized. The right half contained a seven months' fetus. The left half, except that it had only one cornu and attached tube, was about the shape of and slightly larger than a normal uterus.

Cæsarean section by the 'classical' method was done and a living fetus delivered. Although the placenta was situated on the anterior wall subjacent to the line of the incision, very little blood was lost. The uterine incision was closed.

The pelvis was then explored. A large cystic tumour was found deep in the right side of the pelvis. It was about the size of a small foetal head and the walls were somewhat flaccid. It was found to be situated below the uteri and bladder which it was displacing bodily upwards. It also lay completely below the base of the left tube and broad ligament, the leaves of which were not expanded in the manner usual with a broad ligament cyst.

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On account of the gravity of the condition to which *C. cellulosa* can give rise it appears advisable that some steps be taken to ascertain

the incidence of the infection in India and to control its spread both among the indigenous and foreign inhabitants of the country.

Special Articles

HELIOOTHERAPY OR SUN CURE

By N. R. NADIG, L.C.P.S.

Tuberculosis Clinic, Hubli

History.—The body depends not only on food but on light for its life, and even the lightest clothing constitutes an artificial barrier between the body and the sun, that great source of life and energy. The practice of sun cure is as old as the earth, and a common saying is that 'There is nothing new under the sun'.

Experimental contributions.—The remarkable successes of isolation in cases of surgical tuberculosis at high altitudes have largely been ascribed to the influence of the sun's rays. The results obtained by the research methods of Hertz and Roselett are as follows:—

(a) The difference in intensity of ultra-violet radiation in the sun between mountain and lowlands is greater in winter and becomes proportionately smaller as we approach the warmer season.

(b) The power of ultra-violet radiation is always less in the lowlands than at an altitude.

(c) The decline of intensity from summer to winter is less in the mountains than at sea-level. The first deduction demonstrates the importance of sun cure. The second leads us to the fact that the sun cure should be extended over the winter months and a patient treated in winter at sea-level has to interrupt his sun cure for want of sufficient intensity. In contrast, winter in the mountains permits of a continuous cure.

(d) The ultra-violet rays from the sun cause skin pigmentation. They are absorbed in the superficial layers of the skin and their energy becomes transformed into chemical energy in the tissues and in the blood, and as a result we see formation of pigment.

(e) (i) Increase in the red blood corpuscles.

(ii) Hæmoglobin and total amount of blood also show an increase.

(iii) No increase in the white cells, rather a tendency to leucopenia.

Climatology.—The ideal climate for the practice of sun cure would be one that would allow of a certain daily number of sunshine hours throughout the year and which would permit of an extensive and uninterrupted use of pure fresh air. Flat country and sea climates are unsuitable for obvious reasons. The duration of sunshine hours there is less and there is more humidity and dampness in the air. The light rays are chemically weakened by their passage through the atmospheric layers and there is absence of germ-free air. So sun cure can only be applied in institutions at high altitudes.

How far the substitution of artificial light for sunlight can be successful in the treatment of surgical tuberculosis is still undecided. At present no final judgment has been given.

The choice of eminent heliotherapists, like Dr. Rollier of Leysin in Switzerland, falls on the sunlight cure if it takes place in germ-free pure air as opposed to the vitiated air in closed rooms where artificial light treatment is usually given. Splendid results are obtained by the tonic action of the pure air and of light. The idea that the curative effect of the sun rests exclusively on its ability to produce hyperæmia is not correct. The artificial light from a lamp also produces hyperæmia of the parts exposed though it does not produce the same results as have been claimed by sun treatment and it is not yet known how the latter acts.

In a general survey of sunlight cure Dr. Rollier says:—

'After twenty years spent on the practical application of heliotherapy I feel justified in claiming that the method is capable of curing surgical tuberculosis in all its forms in all cases, however bad, and at any age. And I shall never weary of repeating the basic principle of this treatment that the conception of surgical tuberculosis as a local disease which must only be treated locally cannot be maintained any longer. Surgical tuberculosis is a general disease, and as such it calls for a general treatment.'

Of all infectious diseases tuberculosis is the one in which the ground, the substrate that subserves its spreading tendencies, is of paramount importance. Therefore only such a method of treatment can be regarded as rational and promising which aims at reforming and reconstructing the ground, the body generally. The methodical application of heliotherapy as recommended by me in 1903 combined with high mountain air appears to me to satisfy the requirements I have indicated.

Apart from the tonic effect of the mixture of sun and air, the direct rays of the sun possess powerful bactericidal effect in addition to their analgesic and absorptive properties and the unkilld bacilli that remain behind are rendered harmless.

Man does not live on bread alone, he feeds on air as well, this being the bread of respiration. Over and above the digestive and respiratory nourishment there is also a cutaneous one.

Of course in the interest of the large number of surgically tuberculous individuals who cannot be brought under the so favourable conditions, further perfection of the artificial sources of light is most urgently needed'.

Technique, dosage and clinical results

'A word of warning, however, must be given about taking the sun cure. There is an inherent appeal in the sun bath and one is very easily persuaded as to its virtues. The result not infrequently is that the sun-bath enthusiast over-indulges with painful consequences.

The fundamental principles needed here are:—

Careful graduation of dose. Speaking generally sun baths are to be administered in such doses that the

reaction which they set up in the form of headache, malaise, fever, loss of appetite, feeling of lassitude, and insomnia, etc., have no deleterious effect on the organism.

A careful general examination of the patient before submitting him to sun treatment is absolutely indispensable. The state of his lungs and heart should be examined, equally his temperature, respiration, pulse, blood pressure, hæmoglobin and his urine should be subjected to a searching examination. During the first few days, rest in bed indoors is imperative and only gradually is the patient allowed to get accustomed to the open air and sun.

In order to facilitate the practice of sun bathing the plan of treatment which was first suggested by Dr. Rollier is the best and has been adopted by many heliotherapists.

No hard and fast rule can be laid down as regards the right temperature of the sun bath which patients can stand without making any complaint.

First and foremost is to employ moderation and amidst relatively cool surroundings, because if the air is hot it might readily turn into a steam bath which is fatiguing and depressing and which in addition favours congestion of the inner organs. That is why lung cases of nodular type with exudative manifestations are unsuitable for this treatment. For this reason the treatment should be given in summer between 6 and 10 a.m. The midday hours when the sun is directly overhead are not suitable for sun bathing. During summer the best time is in the morning when the sun's rays strike the earth at an obtuse angle. In winter as well as during intermediate seasons the treatment can be kept up the whole morning and even in the afternoon, due regard being paid of course to the prevailing atmospheric conditions. The patient should always protect his head from the direct rays of the sun.

The tuberculous affections treated by sunlight are—

Tuberculosis of spine (spondylitis), hip joint, glands, sinuses, mucous membranes, abdominal tuberculosis, skin, eye, larynx, kidney and epididymis.

There should always be radiological control of the results.

Some of the non-tuberculous affections treated by sunlight

Contusions and lacerations, varicose and syphilitic ulcers, burns, fractures, cellulitis, abscesses, osteomyelitis, rickets (and other bone diseases), and anæmia.

Contra-indications to sun treatment

Heart and kidney disease and nodular lung tuberculosis as there are chances of hæmorrhage as a result of congestion in the deeper organs.

On the other hand it is not contra-indicated in advanced age, amyloid and other degenerative diseases and pulmonary tuberculosis of cirrhotic and fibrous type.

(Continued at foot of next column)

THE CLASSIFICATION OF THE ANÆMIAS

(A RÉSUMÉ OF A CLINICAL LECTURE)

By L. EVERARD NAPIER, M.R.C.P. (Lond.)

School of Tropical Medicine, Calcutta

THE necessity for a reclassification of the anæmias has been apparent for some considerable time. The old classification into primary and secondary had become meaningless, but as hæmatology appeared to be in the doldrums during the first two decades of this century, no

(Continued from previous column)

Fever is not a contra-indication, but one must exercise care and watch the temperature carefully, and gradually it will fall to normal and the result is very satisfactory.

Sun therapy as a prophylactic

Being able on the one hand to cure even advanced tuberculous affections and to prevent relapses, heliotherapy can on the other hand render still greater service to a community by preventing fresh outbreaks of tuberculosis.

According to contemporary views tuberculous infection takes place generally in childhood, all or nearly all children (95 per cent) have to face this infectious disease before reaching adolescence. It is common knowledge that this ailment is contracted through the respiratory passages but not infrequently also through the digestive tract. Borne by the lymph stream the bacilli become first imprisoned in the lymphatic glands. If the body has a good resisting power the infection stops at the first glandular barrier and leads to a kind of auto-inoculation which gives the child a certain degree of protection for the future. The great significance of self-protection is based on the now generally recognized theory according to which tuberculosis of adults is to be regarded in nearly every case as an endogenous reinfection, following the flaring up of an old trouble which may have dated back to infancy and remained latent in the glands.

Since the germ invades the body in childhood we have to fight the invader at this early age and render it innocuous so as to prevent its reawakening later on. To do this it suffices to raise the power of resistance on the part of the child by exposing its growing body to sunlight and open air.

In conclusion we urge on the medical profession as a whole the importance and value of heliotherapy and if this recognition comes about the lay public will soon be led to appreciate the powerful curative and prophylactic agent that is ready to their hands, and whoever assists in spreading this knowledge will be doing an important work for the good of his country and should be regarded as a true patriot.

Provisional classification

Main groups	Smaller groups	Examples of clinical syndromes	Generic characters of blood picture
I. True secondary anæmia.	Due to hæmorrhage, external, from mucous surfaces, or into serous cavities:—	(A) Severed femoral or brachial artery, rupture of spleen, or hæmothorax.	The blood picture will depend on whether the condition is acute or chronic.
	(A) Following external or internal injury.	(B) (i) Alimentary tract from mouth to anus, e.g., from (a) teeth, (b) gastric, duodenal, typhoid or dysenteric ulcer, or malignant disease, or from (c) hæmorrhoids.	
	(B) Associated with disease of tissues.	(ii) Respiratory tract, e.g., from nose, or lung (in phthisis).	(A) will in nearly every instance be acute and (D) chronic; (B) and (C) may be acute or chronic.
		(iii) Urinary or genital tract, e.g., stone, malignant or benign new growth in kidney, renal pelvis or bladder, ectopic gestation bleeding into peritoneum, ante- or postpartum hæmorrhage, or metrorrhagia.	<i>Acute.</i> <i>Chronic.</i>
		(iv) Blood vessels in other situations, e.g., aneurism. New growth involving large arteries. Suppurating wounds.	Normocytic or slightly microcytic, orthochromic.
	(C) Associated with disease affecting the (i) blood, (ii) capillaries.	(C) (i) Congenital defect, e.g., hæmophilia. Idiopathic disease, e.g., thrombocytopenia.	Reticulocytes+ + Reticulocytes + or ±. Erythroblasts, polychromasia, and anisocytosis.
	(D) Associated with parasitic infections.	(D) Hookworm and bilharzia infection with loss of blood into intestinal and urinary tracts.	Van den Bergh reaction negative. No increase of urobilin in urine.
II. Errors of erythrogenesis.	(A) Aplasia or hyperplasia of toxic or mechanical origin.	(i) Idiopathic aplastic anæmia.	A large and varied group, but generally, Normocytic. Orthochromic. Reticulocytes few. Van den Bergh negative. No urobilin.
	Due to— (i) Unknown causes, i.e., primary. (ii) Micro-organismal and metabolic toxins. (iii) Chemical poisons. (iv) Mechanical interference with blood formation. (v) Exhaustion.	(ii) Anæmia of chronic sepsis, influenza, etc. Anæmia of chronic nephritis. (iii) Anæmia due to radium, x-rays, benzol, lead, etc. (iv) Carcinomatosis, Albers-Schonberg disease, possibly the anæmia of kala-azar. (v) Terminal aplasia in almost any anæmia, e.g., pernicious anæmia and anæmia of sprue.	

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Main groups	Smaller groups	Examples of clinical syndromes	Generic characters of blood picture
	(B) Dysplasias—nutritional. (i) Iron deficiency. (a) Actual. (b) Relative. (c) Failure of absorption. (ii) Deficiency of hæmopoietic principle. (a) Absence of intrinsic factor in stomach. (b) Absence of extrinsic factor in diet. (a) Actual. (β) Relative. (c) Failure of absorption of the hæmopoietic principle. (iii) Deficiency of (a) Vitamin C. (b) Thyroxin.	(i) (a) Hypochromic anæmia of infants and others. (b) Hypochromic anæmia of pregnancy and of hookworm infection. (c) Simple achlorhydric anæmia and anæmia following gastric operations. (ii) (a) Addisonian pernicious anæmia. (b) () Idiopathic tropical macrocytic anæmia. (β) Tropical macrocytic anæmia associated with pregnancy and also with splenic enlargement. (c) Anæmia of sprue. (iii) (a) Anæmia of scurvy. (b) Anæmia of myxœdema.	{ Microcytic. Hypochromic. Reticulocytes ±. Urobilin, no increase. Van den Bergh negative. Normoblasts. Macrocytic. Hyperchromic. (a) Reticulocytes +, van den Bergh +, urobilin + [achlorhydria]. (b) Reticulocytes ±, van den Bergh —ive [normal gastric secretion]. (c) Ditto [hypochlorhydria]. (a and b) Microcytic. Hypochromic. (b) Also Macrocytic. Hyperchromic.
III. Errors of erythrolysis.	(A) Conditions affecting the red cells and rendering them more susceptible to normal lytic processes. (i) Abnormality of red cell structure. (ii) Abnormality of physical condition of red cells, e.g., increased fragility. (iii) Effect of toxins, snake venoms, chemical poisons, etc. (iv) Parasitization. (v) Unknown causes. (B) Conditions causing overaction of erythrolytic tissues.	(i) Sickle-celled anæmia. (ii) Acholuric jaundice, paroxysmal hæmoglobinuria. (iii) Anæmia associated with streptococcal and other bacterial infections, lead poisoning, novarsenobillon injections, etc. (iv) Malaria and Oroya fever. (v) Acute hæmolytic anæmia of Lederer. (B) 'Bengal splenomegaly', and probably chronic malaria and kala-azar.	Microcytic or normocytic. Orthochromic usually. Occasionally slightly hyper- or hypochromic. Reticulocytes + +. Urobilin + + +. Van den Bergh + +. Increased fragility of red cells. As above, but decreased red cell fragility.

inspiration for a reclassification was forthcoming. With the hæmatological renaissance that commenced about ten years ago, numerous classifications, mostly based on the size and colour of the red cells, were suggested, e.g., Wintrobe (1930) and Haden (1932), but none of these seemed entirely satisfactory, as they hadn't an ætiological basis. As an understanding of the ætiology of an anæmic state is an essential preliminary to its proper treatment, it seems only reasonable that any new classification should have this ætiological basis.

In the writer's opinion by far the best exposition in the ætiology of the anæmias was given by Professor L. J. Witts in his Goulstonian lectures in 1932. The outline of the classification given below was prepared by the writer for his own use after reading these lectures (*vide* Editorial, *Indian Med. Gaz.*, 1933, LXVIII, 217), and has subsequently been elaborated and used as a guide to the students of the L.T.M. and D.T.M. classes at the Calcutta School of Tropical Medicine attending clinical lectures on anæmia. The writer lays no claim to originality for this classification and he hopes that it exhibits none, as it is only intended to be an interpretation of recent work on this important subject.

An ætiological classification must necessarily be provisional, for, as our knowledge advances, a reshuffling may be necessary from time to time. Further, there are many complete gaps in our knowledge regarding the ætiology of certain anæmic states, which makes it impossible to fit every recognized syndrome into this classification; van Jaksch's anæmia is an example.

Splenic anæmia may be said to be another, but as, in the writer's experience, much of the anæmia in this ill-defined condition is due to hæmorrhage and is curable—up to a point—with iron, it can be placed partially under the heading of true secondary anæmia following hæmorrhage due to disease of the tissues [I (B) (i) of the classification].

There are other reasons, besides the incompleteness of our knowledge, why the classification cannot be clean-cut, with each anæmic state in its proper pigeon-hole. There is often more than one process at work, for example, the anæmia of malaria is mainly due to red blood cell destruction by the malarial parasite and therefore comes under III (A) (iv) of the classification, but there is also evidence to show that during a malarial attack there is repression of function of the bone marrow, so that it could also be classified under II (A) (ii).

Then again an anæmic state may pass from one phase to another. For example, pernicious anæmia, a deficiency dysplasia, II (B) (ii) (a), may in its final stages pass into an aplastic anæmia, II (A) (v).

Recent work on pernicious anæmia has suggested that it may not be necessary to postulate

an extrinsic factor to explain the ætiology of pernicious anæmia and that the intrinsic substance present in healthy gastric juice (and absent in pernicious anæmia) is the complete hæmopoietic principle but that it is easily destroyed by peptic digestion, and that the only function of the so-called extrinsic factor is to 'fix' the pepsin.

This explanation is feasible as far as pernicious anæmia is concerned, but it leaves the 'Marmite factor', which is curative in tropical megalocytic anæmia, high and dry. The only way to get round this difficulty would be to raise the extrinsic factor (or the 'Marmite factor') to the dignity of an independent hæmopoietic principle. This would scarcely disturb the classification at all, except that it would leave the anæmia of sprue in an uncertain position.

The table does not require much explanation. It should be noted that the third column is headed '*examples* of clinical syndromes'; it is not intended to be a comprehensive list, though it includes most of the common anæmia syndromes.

Again in column 4, the word 'generic' is used; there will of course be special variations in the hæmatological findings, in each separate disease, which it would be impossible to give in a table of this kind.

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- Haden, R. L. (1932). *Arch. Intern. Med.*, Vol. XLIX, p. 1039.
Wintrobe, M. M. (1930). *Proc. Soc. Exper. Biol. and Med.*, Vol. XXVII, p. 1071.
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Medical News

INTERNATIONAL CONGRESS ON HEPATIC INSUFFICIENCY

FURTHER to our previous communication announcing that the International Congress on Hepatic Insufficiency would take place at Vichy from the 16th to the 18th of September, 1937, under the Chairmanship of Professor Maurice Loeper, a member of the Academy of Medicine.

The proceedings of the Congress will be divided into two sections:—

Medicine and Biology Section:

Presided over by Professor Noel Fiessinger, Professor of Experimental and Comparative Pathology at the Faculty of Paris.

Therapy Section:

Presided over by Professor Mauriac, Dean of the Faculty of Bordeaux.

We would remind you that the Congress on Hepatic Insufficiency will be preceded by the International Congress on Gastro-Enterology, which will be held in Paris on the 13th, 14th and 15th September, 1937.

ABSTRACT OF THE MINUTES OF THE MEETING OF THE BENGAL COUNCIL OF MEDICAL REGISTRATION HELD ON THE 27TH AUGUST, 1935

1. Reports on the inspection of the Jackson Medical School, Jalpaiguri, dated the 25th April, 1935, and 18th

July, 1935, were considered and adopted and it was decided that recognition of the school should be continued for the year ending April 1936, that admission of 25 students during the year be allowed and that future action would depend on the report by the inspection committee after their inspection in October 1935.

2. Report of the inspection committee on the observations made by the authorities of the Ronaldshay Medical School, Burdwan, National Medical Institute, Calcutta, and the Bankura Sammilani Medical School on their last inspection reports was considered and recorded.

3. Government of Bengal notification no. 540-Medl., dated the 14th February, 1935, publishing amendments in the election rules proposed by the Council without material alteration and notification no. 2905-Medl., publishing the revised rules in the final form were recorded.

4. The syllabus in hygiene of the Final Licentiate-ship course as revised by Lieut.-Col. A. D. Stewart, C.I.E., M.B., Ch.B., D.P.H., I.M.S., and endorsed by the Board of Studies was recorded.

5. Revised rules under the Bengal Medical Act, 1914, other than election rules as approved by Government were recorded.

6. Government notification announcing the acceptance of the recommendation of the Council that the L.M.S. diploma granted by the Andhra University be recognized as registrable under section 18 of the Bengal Medical Act, 1914, was recorded.

7. Government notification announcing the acceptance of the recommendation of the Council that the L.M.S. diploma granted by the Rangoon University be recognized as registrable under section 18 of the Bengal Medical Act, 1914, was recorded.

8. Returns submitted by recognized institutions were recorded.

9. Application from Dr. Mrs. Kusumkumari Majumdar, L.M.P., L.M. (Dub.), for the entry of M.D. (Berne U.) against her name as an additional qualification was refused.

10. Report of the committee appointed to consider the undernoted motion of Dr. A. D. Mukherjee, L.M.F., recommending that action be taken in accordance with the suggestion made whenever practicable was adopted:—

'This Council is definitely of opinion that in institutions recognized by this Council each subject excepting medical jurisprudence and hygiene must be taught by separate teachers as is done in the medical institutions of Calcutta and Dacca'.

11. Notifications announcing the appointment of the undermentioned gentlemen as members of the Bengal Council of Medical Registration:—

(1) Rai Bahadur Dr. J. N. Chatterjee in place of Lieut.-Col. B. H. Singh, I.M.S.

(2) Captain C. B. W. Fisher, I.M.S., in place of Lieut.-Col. P. Banerjee, I.M.S.

(3) Khan Sahib Dr. M. M. Khan in place of Major T. H. Thomas, I.M.S.

12. The following two gentlemen being representatives of the Bengal Council of Medical Registration and State Medical Faculty of Bengal were re-nominated to be members of the Bengal Sanitary Board for a fresh term:—

Dr. T. N. Majumdar, L.M.S., D.P.H., D.T.M.

Dr. Abdul Majed, M.B., D.T.M., D.P.H.

13. The report on the revision of the Appendix to the Annual Medical List submitted by the committee was referred to a fresh committee consisting of the Penal and Ethical Cases Committee and Dr. B. C. Roy, M.D., M.R.C.P., F.R.C.S., Dr. K. S. Ray, M.B., Ch.B., and Dr. J. C. Chatterjee, L.M.S., for re-examination.

14. Application from Dr. M. R. Treu, M.D. (Cologne), for registration in the Bengal Medical Register was refused.

15. Dr. A. D. Mukherjee moved the following:—

'This Council is of opinion that with a view to safeguard the interests of registered medical practitioners in the rural areas of Bengal, the Bengal Government be requested to devise ways and means, if needed by legislation, to prevent the practice of the Western System of Medicine by unqualified practitioners'.

This was amended by Dr. B. C. Roy as follows:—

'That this Council is of opinion that with a view to safeguard the interests of registered medical practitioners in Bengal a committee of five members be appointed by the Council to find out to what extent, if any, the interests of registered medical practitioners are affected by the existence of unregistered practitioners and to devise ways and means of remedying the same, provided that the Council may not be subjected to any financial liability in this regard'.

Dr. Mukherjee accepted it as his substantive motion. It was therefore referred to a committee consisting of:—

Dr. B. C. Roy, M.D., M.R.C.P., F.R.C.S.

Dr. K. S. Ray, M.B., Ch.B.

Rai Sahib Dr. P. C. Roy, L.M.P.

Dr. J. C. Chatterjee, L.M.S.

Dr. A. D. Mukherjee, L.M.F.

With power to co-opt additional members.

16. A report of the Penal and Ethical Cases Committee was considered, the only important decision being that action be taken in accordance with the rules to remove Dr. Bipinbihari Gupta's name from the register for advertisement in lay papers.

17. Dr. A. D. Mukherjee moved the following:—

'Resolved that this Council do appoint every year a committee of five members to inspect the different medical examinations held by the State Medical Faculty of Bengal and submit a report to this Council after each inspection'.

It was decided at the suggestion of Dr. B. C. Roy that the Advocate-General's opinion be obtained with regard to the powers of the Council to inspect examinations of the Faculty and the consideration of the matter was postponed.

18. The following motion of Dr. A. D. Mukherjee was referred to the Penal and Ethical Cases Committee for consideration and report:—

'This Council records with concern that the registered medical practitioners are associating themselves with secret remedies and helping the propaganda of these drugs in a manner which ignores the principles of code of ethics. This Council resolves that a warning notice be issued to the registered doctors by the registrar while sending out the voting papers in connection with the ensuing elections'.

ANNUAL CONFERENCE FOR MEDICAL OFFICERS IN INDUSTRY OVERSEAS

It is proposed to hold the annual conference on Thursday, 16th July, 1936, at the London School of Hygiene and Tropical Medicine, in order that medical officers in industry on leave from the tropics may be able to meet their colleagues and discuss their problems.

The main subject for discussion will be the prevention of disease, e.g., the control of malaria and epidemic diseases in the tropics; water supplies; sewage and refuse disposal; housing; the keeping of records; and hygiene generally.

Medical officers practising on plantations, mines, railways, hydro-electric and construction schemes, and development companies generally are invited to attend. Government health officers will also be welcome. Those who are able to attend should apply as early as possible to: The Organizing Secretary, Ross Institute of Tropical Hygiene, London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), London, W.C. 1.

THE FIRST INTERNATIONAL CONGRESS OF SANATORIA AND PRIVATE NURSING HOMES

The First International Congress of Sanatoria and Private Nursing Homes will be held in Budapest at the end of September next. Special invitations shall be sent in due course to all parties concerned. The short extract of lectures, discussions, proposals, etc., should be sent to the following address as early as possible in order that they may be included in the official programme: Committee of the First International Congress of Sanatoria and Private Nursing Homes, Budapest, Margitsziget Sanatorium.

ALL-INDIA MEDICAL LICENTIATES' ASSOCIATION, BOMBAY

NOTICE is hereby given that the subject for the Dr. Joseph Benjamin Prize of the value of Rs. 35 (rupees thirty-five) only, for the year 1936, is *Piles* (*Hæmorrhoides*) and for the Dr. P. S. Ramachandraier's prize of the value of Rs. 25 (twenty-five only), for the year 1936 is *Whooping-cough*.

All *bona fide* members of the Association can compete.

Intending competitors are requested to write papers from practical point and in lecture style, and the same should not exceed 1,000 typed lines or their equivalent.

The papers should be sent to Dr. Joseph Benjamin, President, Gujarat Branch, All-India Medical Licentiates' Association, Dhalgarwada, Ahmedabad, so as to reach him on or before the 30th September, 1936.

(Sd.) P. R. TRIVEDI,
Joint Secretary, Gujarat Branch.

LEAGUE OF NATIONS: INFORMATION SECTION

Nutrition considered in Relation to Public Health and to Economic Conditions

THIS pamphlet issued by the League of Nations is primarily intended to introduce the idea that agricultural prosperity should take into account the modern knowledge of nutrition and its importance for health as has already been shown by planned observations on children in Great Britain. The remark of Mr. S. M. Bruce of Australia as 'marrying agriculture and health with the science nutrition as officiating priest is indeed a happy one'. We hear the cry of the agriculturist for more or perhaps restricted production with adequate remuneration for his labour, but how little is said of the nutritional needs of mankind all over the world and then as a corollary what products should agriculture restrict or promote. In other words, agriculture should take a rather wider view of its problem than merely keeping the farmer alive or improving his position, desperate though it may be. The Viceroy of India, when visiting the Grocers' Exhibition at the Royal Agricultural Hall in London, had conversations with dealers on their rôle in nutrition and enquired whether, if the Government invited them to play their part in a national policy, they would remain on the defensive and cling to their rights or whether they would be prepared to put forward a constructive plan. These are the ideas that are finding root in Britain. How much more important in this country where it is not always a question merely of malnutrition but of famine in certain years. In India with its small-scale production, it means the enlightening of the peasant as to what is the best diet he can produce from his land in order to maintain health. This is a far cry, nevertheless it is one which should receive the consideration of genuine workers for the weal of India.

H. E. C. W.

INDIAN MEDICAL COUNCIL

IN pursuance of the proviso to sub-section (2) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), the Governor-General in Council is pleased to nominate Major-General C. A. Sprawson, C.I.E., M.D., F.R.C.P., D.Litt., K.H.P., I.M.S., Director-General, Indian

Medical Service, as the President of the Medical Council of India, with effect from the 20th March, 1936, *vice* Major-General Sir F. P. Connor, resigned.

The Sixth Andhra Medical Conference will be held at Rajahmundry on the 4th and 5th July, 1936.

Dr. B. C. Roy, M.D., F.R.C.S., of Calcutta has kindly consented to preside.

All the members of the medical profession in Andhra Desa are requested to enrol themselves as delegates and attend the Conference.

Those who intend moving resolutions and wish to read papers on scientific subjects are requested to intimate the Secretary, Dr. P. V. Brahmanandam, before the 20th June, 1936.

Current Topics

An Investigation of Cheap 'Well-Balanced' Diets

By W. R. AYKROYD
and

B. G. KRISHNAN

(Abstracted from the *Indian Journal of Medical Research*, Vol. XXIII, 3rd January, 1936, p. 731)

DURING recent years, as a result of the economic crisis, considerable attention has been given, in a number of countries, to the problem of devising cheap 'well-balanced' diets. Numerous pamphlets have been issued by public health authorities, charitable organizations, etc., which instruct the poor and unemployed how to purchase an adequate diet for a few shillings, dollars, kronen, etc., per week, and often provide a variety of specimen menus for daily consumption; in India a pamphlet on 'balanced diets' has been issued by the Bombay Presidency Baby and Health Week Association, and achieved a wide circulation. As a rule 'well-balanced' diets recommended as suitable for consumption are drawn up by consulting tables of food analyses given in standard textbooks, and applying generally accepted dietary standards. Due regard must, of course, be given to the good habits of the country concerned, for it is of little use to recommend diets which, however cheap and however rich in valuable food factors, are not in conformity with dietary custom. In India the problem of devising satisfactory cheap 'well-balanced' diets is somewhat more complicated, first, because we lack at present precise knowledge of the composition of many Indian food-stuffs, particularly as regards mineral salts and vitamins, and, secondly, because it is doubtful whether dietary standards put forward by American and European physiologists are applicable *in toto* to India. The present paper records an attempt to devise and test in the laboratory a number of cheap 'well-balanced' diets suitable for general consumption in India.

TEST DIETS

The first step was to work out a number of food mixtures which, on the basis of figures given in McCarrison's book 'Food', had an energy value of about 2,700 to 2,800 calories, approximating to the daily requirements of an average man. The test diets, 12 in number, are described in table I. With the exception of diets 11 and 12, they resemble Indian diets in general composition, and are based on common cereal staples. Two foods not produced in India at present on a commercial scale—soya bean and dried skim milk—were included in certain of the diets; these foods are available at reasonable cost in the larger cities, and given popular demand, could presumably be produced in India itself. Condiments, which have little influence on cost or nutritive value, were not included in the diets. Diets 1 to 9 were calculated to cost from Rs. 4 to Rs. 5 per month per adult man, on the basis

of retail prices obtaining in the Madras Presidency. Diet 10, which contains abundant milk, is somewhat costlier. Diet 11 is that given to the stock rats at Coonoor; it contains more milk, in proportion to other

foods, than is likely to be present in any human diet, and was included in the group to provide data as to the growth of our rats in optimum, or at least excellent, dietary circumstances. Diet 12 is the vitamin-free

TABLE I
Composition of test diets

Diet 1				Diet 2			
Raw polished rice	..	12	oz.	Raw polished rice	..	12	oz.
Cambu (<i>Pennisetum typhoides</i>)	..	6	"	Atta (whole wheat flour)	..	6	"
Dhal arhar (<i>Cajanus indicus</i>)	..	1	"	Dhal arhar	..	1	"
Coco-nut oil	..	1	"	Coco-nut oil	..	1	"
Jaggery (unrefined cane sugar)	..	1	"	Jaggery	..	1	"
Root vegetables	..	2	"	Root vegetables	..	2	"
Leafy vegetables	..	8	"	Leafy vegetables	..	8	"
Dried skim milk	..	0.5	"	Dried skim milk	..	0.5	"
Buttermilk (sour skim milk)	..	10	"	Buttermilk	..	10	"
Ground nut (<i>Archis hypogea</i>)	..	1	"	Ground nut	..	1	"
Soya bean	..	1	"	Soya bean	..	1	"
Sodium chloride	..	0.25	"	Sodium chloride	..	0.25	"
Diet 3				Diet 4			
Raw polished rice	..	12	oz.	Raw polished rice	..	12	oz.
Cholam (<i>Sorghum andropogon</i>)	..	6	"	Ragi (<i>Eleusine coracana</i>)	..	6	"
Dhal arhar	..	1	"	Dhal arhar	..	1	"
Coco-nut oil	..	1	"	Coco-nut oil	..	1	"
Jaggery	..	1	"	Jaggery	..	1	"
Root vegetables	..	2	"	Root vegetables	..	2	"
Leafy vegetables	..	8	"	Leafy vegetables	..	8	"
Dried skim milk	..	0.5	"	Dried skim milk	..	0.5	"
Buttermilk	..	10	"	Buttermilk	..	10	"
Ground nut	..	1	"	Ground nut	..	1	"
Soya bean	..	1	"	Soya bean	..	1	"
Sodium chloride	..	0.25	"	Sodium chloride	..	0.25	"
Diet 5				Diet 6			
Cholam	..	18	oz.	Ragi	..	16	oz.
Soya bean	..	2	"	Soya bean	..	2	"
Dhal arhar	..	2	"	Dhal arhar	..	2	"
Jaggery	..	2	"	Jaggery	..	1	"
Leafy vegetables	..	8	"	Leafy vegetables	..	8	"
Root vegetables	..	2	"	Root vegetables	..	2	"
Coco-nut oil	..	1	"	Coco-nut oil	..	1.5	"
Buttermilk	..	6	"	Buttermilk	..	6	"
Diet 7				Diet 8			
Cambu	..	18	oz.	Polished raw rice	..	15	oz.
Soya bean	..	1	"	Soya bean	..	3	"
Dhal arhar	..	0.5	"	Dhal arhar	..	3	"
Jaggery	..	3	"	Jaggery	..	0.5	"
Coco-nut oil	..	1.25	"	Leafy vegetables	..	8	"
Leafy vegetables	..	8	"	Root vegetables	..	2	"
Root vegetables	..	2	"	Coco-nut oil	..	1.5	"
Buttermilk	..	6	"	Buttermilk	..	6	"
Diet 9				Diet 10			
Ragi	..	16	oz.	Atta (whole wheat flour)	..	18	oz.
Black gram (<i>Phaseolus mungo</i>)	..	6	"	Lean meat	..	2	"
Jaggery	..	1	"	Whole milk	..	20	"
<i>Amaranthus gangeticus</i>	..	2	"	Gingelly oil (<i>Sesamum indicum</i>)	..	1	"
Spinach	..	2	"	Ghee	..	1.5	"
Lady's fingers (<i>Hibiscus esculentus</i>)	..	2	"	<i>Colocasia antiquorum</i>	..	2.6	"
Bitter gourd (<i>Momordica charantia</i>)	..	2	"	Potatoes	..	2.7	"
<i>Colocasia antiquorum</i>	..	1	"	Carrots	..	2.7	"
Pumpkin	..	1	"	Cabbage	..	8	"
Plantain fruit	..	2	"	Plantain fruit	..	4	"
Gingelly oil (<i>Sesamum indicum</i>)	..	1.5	"	Dhal arhar	..	1	"
Buttermilk	..	6	"				
Diet 11				Diet 12			
Atta, chapatties smeared with butter,				Purified starch	..	60 parts	Autoclaved at 130°C. for 5 hours.
fresh raw cabbage, fresh raw carrots,				Casein	..	20 "	
sprouted Bengal gram (<i>Cicer arietinum</i>), fresh cow's milk	5.0 c.c.			Olive oil	..	8 "	
per rat daily and meat twice a week.				Salt mixture	..	5 "	
				Cod-liver oil	..	2 "	
				Dried yeast powder	..	5 "	

In diets 1, 2, 3, 4, 5, 6, 7 and 8 green vegetables = lettuce, cabbage and spinach in equal parts.
root vegetables = potatoes and yams in equal parts.

basal diet commonly used in the laboratory, supplemented by cod-liver oil and dried yeast powder. To investigate their nutritive value, the diets were fed to groups of young rats and subjected to chemical analysis.

CHEMICAL ANALYSIS

The diets were analysed for their content of protein, fat, carbohydrate, calcium, phosphorus, iron, vitamin A, and carotene. The results of chemical analysis are set out in table II, the composition of diets 11 and 12 being given, for purposes of comparison, on a 2,700 calorie basis. Vitamin A and carotene estimations were carried out by the spectrographic method described by De.

completely adequate, more milk, green vegetables, etc., must be included than is present in diets 1, 2, 3 and 8.

Diet 6, in which ragi is combined with soya bean, produced excellent growth, and its chemical composition is satisfactory. This diet was calculated to cost a little over Rs. 4 per month.

The calorie values of the diets as calculated on the basis of chemical analysis were in general agreement with estimates based on textbook figures. The proportion of protein in certain of the diets is low according to current standards; on the whole the diets less abundantly supplied with protein (and probably also with vitamin B₂) were those which were least satisfactory judged by the biological test. There is no

TABLE II
Chemical composition of test diets

Diet number	Calories	Protein (grammes)	Fat (grammes)	Carbohydrate (grammes)	Calcium (grammes)	Phosphorus (grammes)	Iron (grammes)	Vitamin A* (γ)	Carotene (γ)
1	2,771	82.1	65.1	464.1	1.01	1.21	0.076	..	6,944
2	2,809	71.6	64.8	484.9	0.83	1.04	0.082	..	7,068
3	2,885	82.0	63.9	496.4	0.85	1.21	0.111	..	7,006
4	2,709	77.2	69.3	444.2	1.44	1.36	0.116	..	6,696
5	2,734	80.4	67.3	452.4	1.36	1.26	0.121	..	6,159
6	2,721	84.6	66.6	445.8	2.70	1.18	0.114	..	7,462
7	2,613	80.2	62.2	433.1	1.17	1.02	0.126	..	6,198
8	2,641	77.2	68.7	428.6	1.46	1.02	0.090	..	7,189
9	2,692	88.1	69.0	429.6	2.30	1.26	0.102	..	7,953
10	2,978	100.6	94.7	430.7	1.57	1.80	0.144	834	9,540
11	Per 2,700 calories	99.4	93.4	366.9	1.60	1.89	0.094	High vitamin A content 8,872	7,506
12		177.1	88.7	299.4	3.40	2.69	0.301		..

* In diets 1 to 9 the only animal foods were dried skim milk and buttermilk, which are negligible sources of vitamin A. Diet 10 contained whole milk, ghee and meat. The vitamin A content of the stock diet (11) is high.

DISCUSSION OF RESULTS

Rat test.—On diets 1, 2, 3, 5 and 8 all the rats did not survive for the experimental period of 12 weeks. On diet 3 there were 6 deaths, on diet 2, 4 deaths, on diets 1 and 8, 2 deaths, and on diet 5, 1 death. Most of these were due to pneumonia and enteritis. Since we have observed that death from intercurrent infections rarely occurs among the animals fed on the stock diet (11), diets which were associated with such infections cannot be regarded as completely satisfactory. In the groups in which deaths occurred, the surviving (and presumably stronger) animals showed moderate growth. Average growth on all the 'cheap' diets was less than that on the stock diet. The Coonoor rats are somewhat smaller than stocks commonly used in dietary studies in England and America, and average increase in weight even in the excellent stock diet is only 10.6 g. per week.

The diets based on a combination of milled rice with cambu, whole wheat flour and cholam respectively (1, 2 and 3) did not satisfactorily pass the biological test, although their protein and mineral content was raised by the addition of dried skim milk. Similarly, diet 8, in which the only cereal present was rice and the protein content was supplemented by a comparatively large addition of soya bean, did not support growth as efficiently as the stock diet, and two of the rats in this group died. The combination of rice with ragi (4) proved more satisfactory. These results suggest that it is difficult to devise a completely satisfactory diet, of which milled rice is the main ingredient, at the low cost of about Rs. 5 per month. It is probable that if a diet based on rice, or rice in combination with cambu, wheat, or cholam, is to be

reason to suppose that fat is present in inadequate amounts. The mineral content of the diets is high, when judged by Sherman's well-known standards. Vitamin A and carotene are probably present in sufficient abundance—the vitamin A activity of the cheap diets being 7 or 8 times that of a diet found to be associated with xerophthalmia. Vitamin C requirements are probably covered by the leafy and root vegetables included in the test diets. In the uncooked state 8 ounces of green vegetables and 2 ounces of root vegetables of the kinds described would contain 150 mg. to 300 mg. of vitamin C. If adult requirements of vitamin C are reckoned as 50 mg. daily, a fair margin is left for losses on cooking.

In devising actual dietary schedules and specimen menus on the basis of these and subsequent investigations, a certain amount of adjustment and replacement will be necessary. A calorie intake of 2,700 to 3,000 would probably meet the needs of average Indian men engaged on average work, at any rate as far as Southern India is concerned; if necessary, the calorie content can be raised by adding extra cereal, without much increase in cost. The energy requirements of women, and children of different ages, can be assessed by applying the international scale of family coefficients, or some other suitable scale, such as Cathcart's.

Our diets were originally conceived as suitable for adult men: they were, however, tested by being fed to growing animals. Generally speaking, the relative cost of adequate diets for different age groups cannot satisfactorily be deduced from a scale of energy requirements. It is usually held that children need more protein and mineral salts per kilo of body-weight than adults. More milk and less cereal and other foods

means increased cost. In considering the cost of minimum adequate diets for children, and also cost per family, it would probably be advisable to assume that children's diet should contain more milk, in proportion to other foods, than is included in our diets.

Pulses (apart from soya bean) are roughly similar in price and food value and thus interchangeable in diet schedules. In the vegetable group considerable variation is possible; potatoes can be replaced by other root vegetables, spinach and cabbage by other green leafy vegetables, etc. As far as our present knowledge goes, vegetable oils in common use in India do not vary greatly in nutritive value.

These experiments may be regarded as a preliminary to devising suitable cheap 'well-balanced' diets for human use. A number of other diets are at present being tested in a similar manner. But it is clear that, while chemical analysis and biological assay may provide useful information as to the value of various dietary combinations, the ultimate test must be their effect on human beings. The next step must be to 'try out' in practice diets resembling those investigated in the laboratory and found satisfactory, e.g., in boarding schools for children.

SUMMARY

A number of diets, costing from Rs. 4 to Rs. 5 per adult man per month, and conforming in a general way with diets in habitual use in India, have been tested by rat growth experiments, and subjected to chemical analysis.

Non-Specific Protein Therapy

By R. L. CECIL, M.D.

(From the *Journal of the American Medical Association*, Vol. CV, 7th December, 1935, p. 1846)

NON-SPECIFIC protein therapy recently celebrated its twentieth anniversary. Like many other new forms of medical treatment, it has had its ups and downs, its defenders and detractors. If during the past few years it has lost some of its former popularity, one need not be surprised, for this has been the fate of most new methods of therapy. Furthermore, whatever prestige protein therapy has lost through the excessive enthusiasm of its supporters is being regained, at least in part, by reason of a better understanding of the fundamental nature of the reactions that follow its use.

In 1913 Fernando Torres, a South American, reported successful results in the treatment of typhoid fever by giving typhoid vaccine intravenously and described the sharp reactions that followed its injection. Typhoid vaccine had been used previously to this in the treatment of typhoid, but the injections had always been given subcutaneously. In 1914 Dessy, Grapiolo and Fossati, also Argentinians, published a paper on the treatment of typhoid with typhoid vaccine. In this article the results obtained by subcutaneous injection were compared with those which followed intravenous injection. The authors concluded that the intravenous method gave much quicker results and described intravenous vaccine therapy in typhoid as a 'brilliant' form of therapy. In 1914 Kraus and Mazza treated typhoid with intravenous injections of typhoid vaccine and noted that many cases so treated terminated abruptly by crisis or rapid lysis and that the mortality rate was definitely reduced. In the same year Ichikawa also reported favourably on this form of treatment. No doubt this method of vaccine treatment was originally intended as a form of specific therapy, but when Kraus and his co-workers later obtained similar results with colon bacillus vaccine they opened the door to non-specific therapy in all its various forms and modifications. Shortly after this, Lüdke showed that excellent results could be obtained in typhoid with intravenous injections of albumose, and Schmidt found that intramuscular injections of boiled milk would produce febrile reactions. Since then a large number

of different agents, many of them proprietary, have been advocated, some for intravenous, others for intramuscular, use.

Miller and Lusk in 1916 were the first to use 'fever therapy' in the United States, when they reported favourably on the intravenous use of typhoid vaccine in arthritis. About this time V. C. Vaughan was writing about poisonous proteins, maintaining that the keystone of the protein molecule was the 'protein poison' and that fever was due to the parenteral destruction of proteins. Vaughan pointed out that the parenteral introduction of bacteria, pathogenic or non-pathogenic, living or dead, was followed by fever and that the fever was not the result of the growth of the bacteria but of bacterial destruction and splitting up of bacterial protein.

A distinction must be made between the terms 'foreign protein therapy' and 'non-specific therapy'. The latter is a broader term, including chemotherapy as well as protein therapy. In the present article, discussion will be limited to protein therapy.

PROTEINS USED

Many forms of protein and protein derivatives have been tried therapeutically. Among the more important may be mentioned:

1. Native proteins, such as egg albumin, milk and casein.
2. Serums, either human or animal.
 - (a) Normal serum.
 - (b) Immune serums, especially diphtheria antitoxin.
3. Protein split products, including peptone, proteose, albumose and histamine.
4. Enzymes and tissue extracts.
5. Bacterial vaccines.
6. Bacterial extracts (tuberculin, Coley's fluid and the like).

Malarial therapy is a form of foreign protein treatment. The protein is set free in the blood of the patient when segmentation of the malarial parasite occurs. The application of bee stings in various rheumatic conditions is probably another instance of protein therapy.

During the last few years a great many commercial protein products have been put on the market. Some of these are derived from milk, others from vegetable proteins, while still others are prepared from bacteria.

At the present time the three proteins most frequently used in America are typhoid vaccine, boiled milk and diphtheria antitoxin. A number of the commercial preparations also enjoy a considerable vogue. Stock and autogenous vaccines of various kinds are used extensively for therapeutic purposes, often no doubt with the intention of stimulating a specific rather than a non-specific reaction, though there is little evidence to support the belief that a specific antigen-antibody mechanism is involved.

METHODS OF ADMINISTRATION

1. *Milk*.—Ordinary skimmed milk, either fresh or pasteurized, is boiled for from five to ten minutes and then cooled to body temperature. The first dose for adults is 5 c.c. injected intramuscularly, usually into the gluteal muscles. The dose is increased 2 or 3 c.c. with each injection until a maximum of from 10 to 15 c.c. is reached.

2. *Diphtheria antitoxin*.—As used for foreign protein therapy, diphtheria antitoxin is not given for its antitoxic property but because it is an available form of horse serum. The dose is not fixed but is usually from 2 to 4 c.c., given intramuscularly. In doses of this size it will usually induce a temperature of from 100 to 101°F.

3. *Vaccines*.—Ordinary stock and autogenous vaccines are given intramuscularly unless sharp thermal reactions are desired. When such is the case, typhoid vaccine is by far the most popular agent and is given intravenously. Ordinary typhoid vaccine is diluted with physiologic solution of sodium chloride to a point

at which 1 c.c. contains 100 million organisms; the initial dose for adults is from 10 to 25 million. Gonococcus vaccine has also been used intravenously in the treatment of gonorrhoeal arthritis, and intravenous injections of streptococcus vaccine are now quite popular in the treatment of infectious arthritis.

I have observed that intravenous injections of Gram-positive bacteria such as the streptococcus, pneumococcus and staphylococcus are much less likely to cause febrile reactions than the Gram-negative organisms such as the gonococcus and typhoid bacillus. The reason for this difference is not clear.

THE NON-SPECIFIC REACTION

The reaction to foreign protein injections varies from an almost imperceptible one to extreme shock associated with high fever, profound vasomotor disturbance and other constitutional phenomena. The reaction depends on the substance injected, the dose employed and the method of administration. It also depends a great deal on the physical condition of the patient and the number of previous injections.

Intramuscular injections of protein usually excite comparatively mild reactions. There may be only some local reaction at the point of injection and a constitutional reaction may be entirely absent. Sometimes a so-called focal reaction occurs, that is, a temporary flare-up of acute symptoms in some focus of infection; but this phenomenon is more frequently observed in the febrile reactions. When milk or some of the other proteins are injected intramuscularly in sufficiently large amounts, the local reaction may be supplemented by a mild chill and a rise of temperature of one or two degrees. With this rise in temperature there may be some increase in the leukocytes.

When foreign proteins are given intravenously, the reactions are sharper and make their appearance more promptly. When, for example, typhoid vaccine is given intravenously, the reaction usually occurs in from half an hour to one hour after the injection. At first there is marked chilliness or an actual rigor, with general aching similar to that observed at the onset of any acute infection. As the chill subsides, the temperature of the patient begins to rise. A maximum temperature of 103 to 105°F. is obtained, usually within two to four hours after the injection. The increase in pulse rate that occurs is in proportion to the fever. Defervescence is usually rapid, though it may be delayed in the first reaction.

In acute infections, such as typhoid or pneumonia, in which a temperature of 102 to 104°F. already exists, the temperature during a protein reaction may sometimes go to 106 or 107°F. For this reason the dose of protein or vaccine should be very carefully gauged in the treatment of febrile conditions. As a rule, the dosage for febrile patients should be about half that for afebrile individuals.

One of the most interesting phases of the protein reaction is its effect on the leukocytes. Immediately following the injection there is a leukopenia due to the reduction of polymorphonuclear cells. With the onset of the chill a gradually increasing leukocytosis takes place, which reaches its maximum in about six hours and then gradually returns to the previous level. The leukocytosis is of the polymorphonuclear type. In afebrile patients the leukocytosis varies from 13,000 to 15,000 per cubic millimetre, but in acute infectious diseases, such as pneumonia, it may reach from 40,000 to 50,000.

The blood pressure shows a gradual rise during the chill. During the period of perspiration, however, the blood pressure gradually returns to normal.

The focal reaction.—The focal reaction ('Herd-reaction' of the Germans) was first described in connection with tuberculosis, in which an injection of tuberculin was followed by exacerbation of symptoms in the original tuberculous focus. With the introduction of foreign protein therapy, focal reactions were noted by many observers. Menzer was the first to observe that tuberculous foci would respond with a

typical focal reaction after the injection of streptococcus vaccine. Since this observation was made, numerous investigators have demonstrated the non-specificity of focal reactions. Almost any inflammatory process, irrespective of aetiology, will react to tuberculin as well as to a great variety of other agents. Even an old traumatic injury may be the site of a focal reaction following the intravenous injection of some foreign protein.

MECHANISM OF THE REACTION

The typical thermal reaction of protein fever can be divided roughly into three phases. Immediately after the intravenous injection there is a short prodromal period, which is characterized by first a stage of latency with no symptoms and later a stage of chill. Then the temperature begins to rise. The period from the onset of fever to the point of maximum temperature is referred to as the first, or 'negative', phase. The second, or 'positive', phase extends from the height of the fever to the return of normal temperature.

Space does not permit of a detailed description of the many physiologic changes that take place in the body during the protein reaction. Hensch lists them as follows: 1. Alterations in the basal metabolism. 2. Peripheral and splanchnic vasomotor changes, including alterations in blood pressure and in the calibre and permeability of the arterioles and capillaries. 3. Alterations in renal function, detectable in the output and in the acidity of the urine, excretion of phenolsulphonphthalein, and concentration of nitrogen, phosphate, urea, uric acid, allantoin and albumin. 4. Alterations in serum ferments, antiferments, antibodies and the Wassermann reaction. 5. Alterations in organic activity demonstrated by increased secretion of lymph, bile, saliva, breast milk and menstrual flow and by changes in the activity of the liver, gastrointestinal tract and spleen. 6. Alterations in the volume, specific gravity, freezing point and viscosity of the blood. 7. Alterations in the cellular elements of the blood. 8. Alterations in the fragility of the blood platelets and in fibrinogen, thrombokinase, coagulation time and sedimentation rate. 9. Alterations in the chemical constituents of the blood, demonstrated by changes in the carbon dioxide tension of the plasma, carbon dioxide combining power, total non-protein nitrogen of whole blood and of serum, sugar tolerance, albumin-globulin ratio and concentration of urea, uric acid, sugar, fat, total serum protein and chlorides.

Just which one or more of these physiologic changes are responsible for the beneficial effects that often follow protein injections, it would be hazardous to say. For example, Jobling and Peterson attached great importance to the mobilization of enzymes, particularly proteases and lipases, following the injection of proteins. Modi in a recent article objects to the term 'shock therapy', contending that injections of milk really act as a stimulus to the body. Mueller maintains that in giving protein agents the same activities are affected which are naturally stimulated after bacteria have invaded the body in infections. According to this writer the protein reaction involves a reaction of the entire vegetative nervous system which manifests itself in certain functional changes or organic activities, which are directed into two different channels; first, dilatation and increase of activity in the entire splanchnic area; and, second, contraction of the peripheral vessels and decrease in skin activities and in the functioning of the peripheral organs.

While most writers stress the importance of fever in the protein reaction, Zimmer and Buschmann hold that acute conditions frequently require a fever reaction, while chronic conditions will often be best affected without any fever reaction. Barr, Du Bois and I have found that fever which followed intravenous injection of protease or typhoid vaccine is accompanied by increased heat production, the amount of which corresponds to the degree of fever. It was found that this increase in heat production followed van't Hoff's law, namely, that with a rise in temperature of 10°C. the

velocity of chemical reactions increases between two and three times.

Perhaps the most important function of the foreign protein reaction is the mobilization of immune bodies in the circulating blood. For example, Bieling found that in rabbits immunized against typhoid bacilli there was an increased amount of typhoid agglutinins in the blood following the injection of colon, dysentery or diphtheria bacilli, and these observations have been corroborated by others. Culver noted that in patients with gonorrhœal arthritis the intravenous injections of proteoses stimulated antibody formation just as actively as did gonococcus vaccine. Wolff observed that in rabbits the bactericidal power of the blood could be increased by both specific and non-specific agents. Indeed, it has been shown by numerous authors that any form of fever is conducive to an increase of immune bodies in the circulating blood. Whether this is due to increased formation or to increased mobilization of antibodies it is difficult to say. It has been generally assumed that the beneficial effect of the foreign protein reaction is referable to the fever and that up to a certain point the higher the fever the better the results obtained. There are some, however, who believe that the leukocytosis that accompanies the reaction has important therapeutic value.

UNTOWARD REACTIONS

Severe and even fatal reactions sometimes follow the intravenous injection of foreign protein. Such occurrences, however, usually take place in patients who are already seriously ill or who have been greatly overdosed with protein. There have been surprisingly few severe anaphylactic reactions. Among the complications attributed to foreign protein reactions have been delirium tremens, cardiac failure, vascular thromboses, acute nephritis, herpes labialis, rheumatic purpura, acute diarrhœa, and activation of old pulmonary tuberculosis. As pointed out by Hench, there are certain reported sequelæ of protein treatment, such as appendicitis, cholecystitis, glaucoma, colitis and respiratory infections, for which protein therapy has been deliberately used by the physician with impunity and at times with success. Hench has recently analysed the reaction to typhoid vaccine, in most cases given intravenously, of 2,500 patients at the Mayo Clinic. Unusual reactions were noted in only fourteen cases. These were acute and subacute appendicitis, cholecystitis, enteritis, pleurisy, pericarditis, iritis, glaucoma, adenitis, vascular thrombosis and renal insufficiency. In this large series, death occurred in only three cases, a mortality rate of 0.12 per cent.

I have seen four fatal reactions from foreign protein therapy. Three of these were in patients with lobar pneumonia who had received intravenous injections of pneumococcus aqueous extract (Huntoon's pneumococcus antibody solution). In two of these cases death was apparently due to vasomotor collapse. In the third case a sustained hyperpyrexia was followed by vasomotor collapse and death. The fourth patient was in an advanced stage of dementia paralytica and after receiving typhoid vaccine intravenously developed a hyperpyrexia, which terminated in circulatory collapse and death. I have never seen a dangerous reaction or any serious complications follow the intravenous use of typhoid vaccine in arthritic or in other patients suffering from some mild infection. On the other hand, at the Mayo Clinic, untoward reactions have been noted more frequently in arthritic and vascular cases than in other conditions, though larger doses of protein have usually been employed in dermatologic and urologic cases than in the former groups.

CLINICAL APPLICATION OF PROTEIN THERAPY

The literature on the clinical application of foreign protein therapy in various diseases is so enormous that in a short review of this kind reference can be made to only a limited number of them.

Typhoid.—Typhoid was the first infectious disease to be treated by foreign protein therapy. Twenty years

ago typhoid was still a fairly common disease and at that time a number of excellent studies appeared, reporting the results obtained with protein therapy (Gay and Chickering, McWilliams, Fairley, Wiltshire and MacGillcuddy and others). Miller states that the course of the disease is favourably influenced in 60 per cent of the cases. He adds, however, that intramuscular injections are safer than intravenous injections in this disease. Holler used small doses of a 10 per cent solution of deutero-albumose, beginning with two treatments a day and later giving one treatment daily, continuing the injections until the fever was broken. In 1917 he reported 350 cases treated by this method, with a death rate of only 0.5 per cent and an average duration of the disease of only ten days. So far as I can find, Holler's figures are the most impressive that have been reported in the literature.

Pneumonia.—Pneumonia is a disease for which an efficacious serum therapy is available in more than 60 per cent of the cases. There still remains 40 per cent of pneumococcal pneumonias in which some other form of specific or non-specific treatment would be feasible. In 1922 Larsen and I reported a large series of cases of pneumonia in which Huntoon's antibody solution had been used intravenously in alternate cases. This controlled study offered an opportunity to observe the effect not only of specific but of non-specific therapy as well, for the antibody solution contained immune bodies against only the three dominant types of pneumococci (types I, II and III). Therefore, when it was administered in the miscellaneous types it became a non-specific form of therapy. Furthermore, it was non-specific fever therapy, for each injection of antibody solution was usually followed by a chill and spurt in fever. A series of 110 group IV pneumonias thus treated gave a mortality rate of 16.4 per cent, while 121 untreated group IV cases showed a death rate of 24 per cent.

A similar opportunity occurred when Sutliff and I reported on the effect of Felton's concentrated anti-pneumococcus serum in the treatment of pneumonia. The non-specific effect of type I and type II serum could be studied in the miscellaneous group of pneumonias, this time without febrile reactions. Of 142 group IV patients who received type I-type II serum the death rate was 28.2 per cent. Of 133 group IV patients who received none, the death rate was 38.3 per cent.

Miller treated fifteen cases of lobar pneumonia during the first two days of the disease with a single intravenous injection of typhoid vaccine. In six of the fifteen the pulse, temperature and respiration returned to normal a few hours after the reaction, but this improvement was temporary in three of the six. Three patients were permanently detoxicated and underwent rapid convalescence. Favourable results with typhoid vaccine have also been reported by Cowie and Beaven and by Wells.

It is obvious that in an infection of such comparatively short duration as pneumonia the interpretation of protein therapy would be difficult unless the injections were given very early in the disease. Furthermore, in spite of the statistical evidence in favour of protein fever therapy in pneumonia I feel that it is too drastic a form of treatment for routine use in such a severe infection as pneumonia. The fatal reactions mentioned earlier in this article support such a view.

Sepsis.—The chills and temperature reactions of a patient with sepsis bear a strong resemblance to those which follow intravenous injections of foreign protein. A number of writers have reported favourable results from this method of treatment. For example, Wilmette reported a series of cases of puerperal sepsis with good results, some terminating by crisis. Lüdke treated five cases with three rapid recoveries.

Syphilis.—In the earlier days of protein therapy a number of investigators found it quite valuable in the treatment of the cutaneous manifestations of syphilis. With the development, however, of arsphenamine and

heavy metal therapy, protein treatment has yielded to a more specific form of medication.

Protein therapy has maintained its prestige, however, in the treatment of dementia paralytica and to a less extent in tabes dorsalis. The outstanding advocate of foreign protein therapy in dementia paralytica has been Wagner-Jauregg. The brilliant results obtained in this disease with typhoid vaccine and malarial therapy is indeed amazing when one considers how comparatively little benefit was gained from ordinary treatment of this condition with mercury and the iodides. As early as 1911, Pilcz reported excellent results with tuberculin in the treatment of dementia paralytica. In 1917 malaria was first used therapeutically by Wagner-Jauregg, who employed it in the treatment of dementia paralytica. This investigator had previously tried tuberculin and typhoid vaccine in the treatment of dementia paralytica and had obtained very good results following the febrile reactions produced by these agents. In 1923 his co-worker Gerstmann summarized the results obtained with 2,000 patients in Wagner-Jauregg's clinic, and in 1931 Wagner-Jauregg reported the results in 3,000 cases treated in the Vienna Psychiatric Clinic. The results reported by Wagner-Jauregg and by Gerstmann were most impressive and have been widely corroborated by other investigators in Germany, Great Britain and America. Wagner-Jauregg was convinced that malarial therapy was much superior to other agents for the production of thermal reactions, and this view is now quite widely held by neurologists. There are some, however, who believe that frequent injections of typhoid vaccine are just as efficacious, and certainly typhoid vaccine has practical advantages over malaria. Mackenzie, for example, has obtained excellent results with typhoid vaccine and stresses the absence of the cachexia and anæmia that so often follow malaria. Kunde, Hall and Gerty are enthusiastic over typhoid vaccine therapy in dementia paralytica, and favourable reports have recently been published by Jennings and by Young and Bennett.

Both relapsing fever and rat-bite fever have been used therapeutically in dementia paralytica. The results with relapsing fever as reported by Plaut and Steiner and more recently by Signorelli seem to be about as good as those obtained by others with malaria; this is still further evidence that it is the febrile reaction and not the agent which produced the fever which is the essential part of the treatment.

The results of foreign protein therapy in tabes have not been so brilliant as those obtained in dementia paralytica, though Wagner-Jauregg reports that the lightning pains of gastric crisis are often relieved by this treatment.

Other nervous diseases.—In 1924 Grosz reported very favourably on the treatment of multiple sclerosis with foreign protein therapy. Twenty-nine patients were treated with typhoid vaccine and forty-two with malaria. In both series something more than 25 per cent showed marked improvement. Other writers, notably Dreyfus and Hanau and Schacherl, have also reported good results in this disease. According to Dannhauser and Leiner, encephalitis and post-encephalitic syndromes are favourably affected by protein therapy. Schmidt recommends non-specific therapy for dementia præcox, and Sutton has obtained remarkably good results in chorea with frequent intravenous injections of typhoid vaccine.

The unbiased reader cannot fail to be impressed by the enthusiasm of these writers. However, one should remember that the nervous diseases discussed are all characterized by alternating periods of improvement and relapse; so while one can expect striking improvement in many such cases after fever therapy, the possibility or even probability of a recurrence must always be borne in mind.

Acute and chronic arthritis.—In the field of arthritis foreign protein therapy has achieved considerable success, and probably more articles have been written on the use of protein therapy in the treatment of various

rheumatic conditions than on any other subject. According to Miller 50 per cent of patients with acute arthritis are free from discomfort after from two to three intravenous injections of typhoid vaccine, and in about 25 per cent of these the relief is permanent.

A number of years ago I tried intravenous injection of typhoid vaccine on forty cases of acute arthritis, including a number of cases of rheumatic fever and gonococcal arthritis, and found that 32 per cent made a rapid and complete recovery without recourse to any other treatment, while of the remaining cases all but two showed improvement. The results in the seven cases of gonococcal arthritis were only fairly good. In my opinion foreign protein therapy should always be considered in the treatment of acute arthritis, especially for those cases in which salicylates have failed to give good results.

In chronic arthritis of the rheumatoid type, foreign protein therapy has not proved so satisfactory as in the acute form, though the immediate effects are sometimes quite striking. The swelling of the joints is diminished and the pain is decreased. In the majority of cases, however, relapse occurs sometimes in a few days, sometimes after several weeks or months of comparative freedom from pain. The literature on this subject is so extensive that only a few representative articles can be referred to. Laurie obtained good results in rheumatoid arthritis by first giving a series of injections of colon bacillus vaccine intravenously in the hospital, then having the patient return once a week for additional injections. Löwenstein gave intravenous injections of casein and found them helpful. Snyder and Ramirez obtained 'cures' in only six of their series of 70 cases, and these were all of less than two years' duration. Of the remaining cases, half showed definite improvement in the upper extremities, but in only one-fourth was a similar relief obtained in the lower extremities. Miller, after a wide experience with typhoid vaccine in the treatment of chronic arthritis, states that, in the early stages of rheumatoid arthritis in which there is evidence of marked inflammation, fever therapy will occasionally give gratifying results, terminating the disease sometimes permanently, more frequently for a few months, after which it again becomes active but often yields to a second course of treatment. Campbell treated seventy cases with typhoid vaccine and noted improvement in fifty-eight, though sixteen of these relapsed. In summing up he remarks: 'Protein shock is not and cannot be regarded as an ideal method of treatment, yet I am of the view that in the present state of our knowledge of rheumatoid arthritis, it offers greater possibility of success than any other treatment'.

I have used typhoid vaccine with success in early cases of rheumatoid arthritis; many such patients remain well. It is particularly useful in the febrile type of case. In chronic, well established cases I prefer small intravenous doses of streptococcus vaccine, too small to excite a febrile reaction. This is not a brilliant form of therapy, but, if the injections are continued for several months, many patients make improvement under it. The injections are given every four or five days, in doses that range from 50,000 bacteria to a final dosage of perhaps fifty or a hundred million.

Diseases of the skin. In dermatology, foreign protein therapy has been widely used, and with considerable success, in certain inflammatory conditions, such as furunculosis, carbuncle and other staphylococcal infections of the skin, and to a less extent in ringworm, lupus, pruritus and the like. Sometimes a persistent form of urticaria will yield promptly to boiled milk or to some form of bacterial vaccine. Especially good results have been claimed for colon bacillus vaccine in urticaria. Favourable results have been reported in psoriasis, but in my experience the benefit obtained in this disease has been very short-lived. O'Leary has found foreign protein most beneficial in the treatment of anthrax and erysipelas. Less favourable results were

obtained in staphylococcal infections of the skin. He saw no benefit whatever from the use of non-specific therapy in eczema or in allergic dermatitis. Schmidt reports excellent results with milk therapy in erysipelas. For further data on protein treatment in dermatology the reader is referred to papers by Hall, Weirauk and Low.

Diseases of the eye.—Non-specific therapy in the form of boiled milk or typhoid vaccine has been employed extensively in iritis, uveitis, keratitis, conjunctivitis and other inflammatory conditions of the eye. There seems to be some disagreement as to the benefit to be derived from protein therapy in trachoma. Friedlander and Howard both report good results in this condition, but other writers, such as Steindorff, are not so enthusiastic. Miller states that there is no acute infection in which the results of foreign protein therapy are so good as in acute iritis. According to this writer the results are immediate and the relief permanent, and this opinion is corroborated from many sources. Key produced experimental ulcers on the cornea of rabbits and obtained prompt relief with diphtheria antitoxin.

Scarlett found horse serum just as satisfactory as diphtheria antitoxin. He considers protein therapy a 'valuable adjunct' in the treatment of ocular infections but always in conjunction with regular routine treatment. A. C. Woods believes non-specific protein therapy one of the most valuable of weapons in certain ophthalmologic conditions but warns that it is 'specialized therapy' and that age, duration of disease and condition of the patient must all be considered in every case. Benedict found that, in eye work, shifting from one form of protein therapy to another often proved to be more effective than continuing with the same form. If space permitted, many other enthusiastic reports could be cited, such as those of Allen, Verhoeff and Gaston.

Gynecology.—In pelvic disease the most important field of protein therapy has been in adnexal infections of an acute or subacute type. In such conditions the results of protein therapy have often been quite striking. The consensus seems to be, however, that its chief function is in the relief of pain and extreme tenderness. There is considerable doubt as to just how often a tubal infection is 'cured' by protein therapy. Gellhorn is enthusiastic over injections of milk for such infections, particularly gonorrhoeal infection of the tubes and Bartholin's glands. Chiaudano employed milk, but he is not so enthusiastic, nor is Kauert, who employed 'aolan', a milk derivative. Other writers, however, notably Rawls, Mohler, Llewellyn, Jarcho, Champlin and Hibbert, used either milk or aolan with excellent effect.

L. H. Stuhler of the Mayo Clinic has found foreign protein therapy a good measure in pelvic cellulitis and in acute as well as chronic salpingitis. In his experience it is especially adapted to those early cases in which pus formation has not yet started. He considers protein therapy of value even in the well advanced cases, and in his opinion it is the method of choice in cases in which surgery is not yet indicated or is contra-indicated. Stuhler believes that protein therapy has saved a great many patients from major surgical operations. This writer goes so far as to say that if he were limited to one method of treatment in salpingitis he would choose foreign protein therapy without hesitation.

Genito-urinary infections.—Gonorrhoea and its complications have been treated by various forms of non-specific therapy as well as by gonococcus vaccine. Particularly good results have been reported in epididymitis and in gonococcal arthritis. Antoni and Müller have noted remarkable results from milk therapy in buboes.

For gonococcal infections, however, fever therapy is now more successfully used in the form of diathermy or the 'short wave' than by typhoid or gonococcus vaccine. The subject of fever therapy in gonococcal

infections is well reviewed in a recent article by Desjardins, Stuhler and Popp.

Peptic ulcer.—One would hardly expect protein therapy to have any value in the treatment of peptic ulcer. Pribram, however, has reported a large series of ulcers treated by intravenous injections of a vegetable albumin (novoprotein) and states that the pain was much relieved in from 50 to 60 per cent of the cases. He even goes so far as to assert that roentgen observations indicate healing of the ulcer. Treatments were given at intervals of from two to four days, the patient receiving a total of eight or ten injections. Martin, Mueller, Miller and others have confirmed Pribram's results, at least so far as relief of gastric pain is concerned. Miller found that immediate effect of typhoid vaccine on ulcers was very good and stresses the alleviation of pain. A certain number of his cases, however, relapsed shortly after the treatment. In view of the marked tendency of ulcers to periodic remissions and exacerbations, the results of protein therapy in such conditions must be accepted with considerable reservation.

Vascular disease.—One of the newer fields for foreign protein therapy is that of vascular disease, particularly thrombo-angiitis obliterans. In vascular disease, however, it is probably the vasodilatation rather than the fever, leukocytosis or mobilization of immune bodies that is responsible for the beneficial effect obtained. According to Wright, the desired physiologic effect of fever therapy in vascular disease is release of spasm of the partially occluded vessels with resulting increase in the local capillary circulation. This is followed by cessation of pain and healing of ulcerations, if they exist.

The pain in thrombo-angiitis obliterans is often excruciating, and Brown considers the intravenous administration of typhoid vaccine the best medical measure for its relief. Allen and Smithwick have reported successful results with typhoid vaccine in Buerger's disease, in the gangrene of arteriosclerosis, and in purely vasomotor types of vascular occlusion. These authors used doses of from 125 to 300 million bacilli, but Wright believes that the chill should be avoided and recommends small doses, just enough to produce 2 or 3 degrees of fever. Wright recommends an initial dose of 10 million typhoid bacilli, with an increase of 10 million with each subsequent injection.

Goodman and Gottesman have also reported enthusiastically on the use of fever therapy in vascular disease, particularly Raynaud's disease. They say: 'Our most satisfactory results were obtained in the three cases of Raynaud's disease that we treated with foreign protein. Immediate and lasting improvement resulted in each case. No other treatment was employed'.

It would appear from this brief survey that protein therapy has found one of its most important uses in vascular disease. The danger of thrombosis as a complication of the treatment must be kept in mind. It is for this reason that Wright warns against inducing chills in these patients and advises small doses of protein that will produce fever without the preceding rigor. Barker of the Mayo Clinic has recently reported favourable results in peripheral vascular disease with typhoid H antigen. This antigen is a derivative of the typhoid bacillus and when injected intravenously produces fever but definitely less chill than the ordinary typhoid vaccine. In view of the absence or diminution of the chill, Barker believes that it is a better product for vascular disease than the usual typhoid vaccine.

Allergic diseases.—In 1909 Biedl and Kraus found that an animal sensitized to a foreign protein could be partially desensitized with peptone, and this work has been confirmed by other investigators. No doubt this explains the beneficial effects sometimes obtained by protein therapy in such conditions as asthma, hay fever and urticaria. Rackemann has pointed out that bacterial vaccines in asthma are beneficial in proportion to their power to produce a local reaction at the site of

injection. I once saw an accidental local infection in the arm of an asthmatic patient at the site of a vaccine injection. The improvement that ensued from this local infection was much more marked than that which the patient received from any subsequent vaccine injections. Van Leeuwen has used tuberculin in the treatment of asthma and reports 300 cases treated by this method with 50 per cent completely or almost completely cured and from 25 to 30 per cent improved.

As Miller remarks, however, it is difficult to explain the permanent cures reported by various writers on asthma, for it is generally recognized that desensitization is a more or less temporary state.

CONTRA-INDICATIONS

The more important contra-indications to intravenous foreign protein therapy are:

1. Advanced arterial, renal or cardiac disease. Patients with cardiac decompensation should not have intravenous protein therapy. On the other hand, rheumatic endocarditis with good compensation is not a contra-indication.

2. Allergic states or conditions of marked protein sensitivity, such as angioneurotic oedema, giant-urticaria and the like.

3. States of extreme exhaustion following prolonged illness.

4. Pulmonary tuberculosis, active or quiescent.

5. Hæmorrhagic conditions, such as hæmophilia, bleeding ulcers and the like.

6. Chronic alcoholism, for fear of delirium tremens.

7. Marked nervous sensibility, such as that seen in hyperthyroidism and the like.

The contra-indications for subcutaneous or intramuscular injections of protein are much less stringent than for the intravenous injections. Indeed, there are very few patients who cannot take with impunity small doses of bacterial vaccine, boiled milk or serum subcutaneously.

There has been considerable difference of opinion concerning the danger of protein therapy in patients with pulmonary tuberculosis. A number of writers have reported pulmonary focal reactions in tuberculous patients after injections of protein. Hektoen and Irons cite five cases of latent pulmonary tuberculosis activated by the use of stock vaccines. I recall one case of spondylitis in a young man who was treated in the New York Hospital with typhoid vaccine intravenously and who developed active pulmonary tuberculosis a short time after leaving the hospital. On the other hand, Brown, Heise, Petroff and Wilson noted focal activation in only two of 124 tuberculous patients who received typhoid vaccine subcutaneously for prophylactic purposes.

COMMENT

One of the most difficult problems in modern medicine is the proper evaluation of new therapeutic measures that cannot be tested accurately either by animal experimentation or by carefully controlled statistical studies on patients but which rest for their acceptance entirely on an empirical basis. Foreign protein therapy is an excellent example of such a form of treatment. Animals have been used for studying the physiologic effect of proteins, but with the exception of Key's studies on experimental iritis in rabbits there has been very little effort to test the value of foreign protein experimentally. Numerous statistical studies on foreign protein therapy have been reported, but most of them have been uncontrolled—an omission that perhaps is pardonable in the study of chronic infections, in which controls are always difficult of interpretation.

Whatever popularity foreign protein therapy has received rests largely on an empirical basis. The earliest reports were clinical studies on patients. Experimental work came later. These facts, however,

should not raise prejudice against protein treatment, provided the clinical reports can be relied on. Physicians have always been compelled by force of necessity to make use of empirical remedies in the treatment of disease and will probably continue to do so for many years to come.

What then should be the place of foreign protein therapy in modern practice? This question can be answered readily enough with respect to subcutaneous and intramuscular injections of vaccines or proteins such as milk, peptone and the like, which produce little or no reaction in the patient when given in reasonable doses. As a rule these injections do no harm, but often they fail to do any good. The benefit to be derived from protein therapy often seems to be in proportion to the amount of constitutional reaction and fever produced. Such being the case, the physician will in many cases be tempted to resort to intravenous protein therapy with some fever-producing substance like typhoid vaccine, and what every practitioner would like to know is just when he is justified in using this rather drastic form of treatment. He has in mind the question once propounded by Theobald Smith: How much energy does a reaction of this sort cost the patient, and is the final result worth the cost?

I am disposed to agree with Miller that typhoid vaccine, when given in proper doses and to carefully selected patients, is not a dangerous form of therapy. In the case of intravenous therapy, the most important precautions are: to (1) make the first dose a small one and (2) not to try protein therapy on patients who are in an extreme state of exhaustion. The indications and contra-indications for this method of treatment have already been discussed. Experience with any form of therapy is a valuable asset to the practitioner, especially when an element of risk enters into its application. Protein therapy falls into this category, but any well trained physician should be qualified to practice it, provided he will take the necessary precautions. I much prefer to administer fever therapy in a hospital. It can be undertaken in the patient's home if a nurse is in attendance, but the hospital is much to be preferred. Under no conditions should fever therapy be undertaken in the doctor's office. There is too much danger of a chill on the way home.

I believe that foreign protein therapy will always find its greatest usefulness in acute and subacute infections. The glowing reports by some writers on the achievements of protein therapy in various chronic diseases have not been widely corroborated. It is significant that many of these rather startling claims have been made with regard to certain chronic infections such as peptic ulcer, multiple sclerosis and chronic arthritis, which are characterized by periodic remissions and exacerbations.

A great many proprietary remedies have been offered to the medical profession as substitutes for milk, serum and ordinary bacterial vaccines. In many cases special claims have been made for these products, in language that is often mystifying, to say the least. As an example, I quote the following from an editorial in *The Journal of the American Medical Association* concerning the claims made for 'Proto-Enzyme for the Involvements in Gonorrhœa': 'The non-specific proteins contained are claimed to stimulate the production of phagocytes which "attack and ingest the starved gonococci, changing them into peptones and releasing these peptones osmotically into the blood stream", where they are taken up by red blood corpuscles . . . carried . . . to the liver, where they are split by the hepatic hormones into fatty acids and urates, and . . . easily eliminated by the emunctories'. It is doubtful whether the man who wrote these words knew what they meant; certainly they mean nothing to a physician who knows his physiology. Furthermore, it is extremely unlikely that these commercial products possess any virtues which are not equally inherent in typhoid vaccine, or the other agents commonly employed for non-specific therapy.

Finally, as remarked by Hench, foreign protein therapy may prove to be more 'specific' than 'non-specific'. Foreign protein produces a great many different kinds of specific reactions in the body. It is already being found that some of these reactions are helpful in one disease, while others are helpful in another. For example, in the treatment of peptic ulcer the specific effect desired is to keep the gastric acidity low. In dementia paralytica the fever is presumed to be the desirable part of the reaction. In vascular disease we are concerned exclusively with the degree of vasomotor dilatation produced. In certain other infections it may be the leukocytosis or the mobilization of the specific immune bodies that produces the beneficial result. The future study of foreign protein therapy will no doubt bring to light many new facts which will eventually take this procedure out of the realm of 'non-specific' into that of 'specific' treatment, and it is quite possible that, while for the moment foreign protein therapy may seem to have lost some of its prestige and popularity, we may be on the verge of information that will result in a renewed and more skilful application of this method in the treatment of disease.

CONCLUSION

It may be said that protein therapy, after twenty years of investigation and clinical trial, rests on a sound foundation and has now achieved a permanent though limited place for itself in modern therapeutics. In the realm of infectious diseases it has met with general acceptance in the treatment of: (1) infections of the eye, (2) acute and subacute pelvic infections, (3) certain infections of the skin, (4) a few generalized infections, such as sepsis and typhoid, (5) acute and chronic forms of infectious arthritis, and (6) cerebrospinal syphilis, especially dementia paralytica.

In the field of vascular disease, notably in thromboangiitis obliterans, foreign protein therapy also appears to have earned a secure therapeutic position.

Juvenile Leprosy

By DR. E. MUIR

(From the *International Journal of Leprosy*, Vol. IV, No. 1, 1936, p. 45)

It is usual to classify leprosy into neural and cutaneous types according to whether the signs are chiefly connected with the nerves or with the skin, these being the two sites in which the disease is most evident. Cases in which the nerves alone are infected are rare, but cases in which the skin alone is affected are even rarer, if they ever exist at all. The terms 'neural' and 'cutaneous' leprosy must therefore be understood as only comparative terms indicating that the preponderance of clinical signs are connected with the one or other organ.

Leprosy infection is of exceedingly low toxicity; so that a patient may have a very high degree of infection and yet show practically no toxic signs. He may appear strong and healthy and do a strenuous day's work without undue fatigue. The general and local signs of lepra fever, which are so distressing to the patient, are of an allergic rather than a toxic nature. Apart from lepra fever, the ordinary signs and symptoms of leprosy are due chiefly to the local response of cells to bacilli in their neighbourhood.

The degree of local cell response varies with the resistance of the body to the infection. If the resistance is low, and the cellular reaction therefore comparatively slight, a state resembling symbiosis is established between *Mycobacterium lepræ* and body tissues. The multiplication of cells in response to the bacilli in their neighbourhood is diminished, and bacilli remain in the intracellular spaces instead of being ingested by the cells. Those that are ingested multiply inside the cells instead of being phagocytosed and destroyed. The

tolerance of the cells for the organisms is even more marked in the nerves than the skin, so that there may be a mild cellular response in the skin while there is practically none in the nerves. Thus in typical cases of skin leprosy, in which there are widespread lepromatous changes in the skin, the corresponding nerves may appear clinically normal but sections may show large masses of bacilli lying between the nerve fibres with little or no cellular response to their presence.

This total or partial symbiotic effect may be brought about or contributed to by one or more of three factors: (a) the age of the patient, juveniles being particularly tolerant or non-resistant to the infection; (b) debility, from whatever cause; and (c) high concentration of leprosy bacilli in the body. The object of this paper is to describe a type of leprosy which I have termed 'juvenile leprosy' and which is due in large measure to the first of these factors, viz, the tolerance of the tissues of the body for *Mycobacterium lepræ* during the first few years of life.

A young child is brought in contact with a highly infectious case of leprosy. On account of his tender age, resistance to the bacillus is low, and infection is therefore able to spread throughout the body undeterred by phagocytic action of the cells and without causing any very marked clinical signs or symptoms. If the child is debilitated general infection will take place all the more readily. In the case of a normal child, as he grows older his resistance to the bacillus tends to increase, but when in early childhood widespread infection has taken place the third factor prevents this increase and resistance accordingly remains low.

Juvenile leprosy is therefore caused by an extensive infection during the bacillus-tolerant early years of life. This extensive infection maintains the low resistance when adult age is reached (see the third tolerance-producing factor).

As might be expected from the above description, the clinical signs of juvenile leprosy are absent, slight or intermittent. The thickening of nerves, anaesthesia and other neural symptoms are absent, or at least so slight that they cannot be made out with any certainty. Ill-defined macules are found with keratosis, hypopigmentation (showing best in dark skins) and erythema (showing best in fair skins). The margin is level with and fades away into the surrounding skin. These macules may increase in size, but as they spread at the margin they tend to become more and more ill-defined. They may appear and disappear from time to time. On section a mild degree of cellular increase is found, especially around the sub-papillary plexus; a few bacilli may or may not be found, especially in that layer of the skin. Considerable experience of these cases is necessary in making a diagnosis, especially if the bacteriological examination is negative, and a history of contact with an infectious case is of great importance. Chyuto has shown that these indefinite macules of juvenile leprosy often develop into definite leprous lesions of the skin type later on in life, and there is good reason to believe that juvenile leprosy frequently passes undetected until the grosser type supervenes, and that in endemic countries it occurs far more commonly than is supposed.

Juvenile leprosy may appear at a very early age. I have seen a child of 3 months with many macules of this type. After puberty it is uncommon, the infection either clearing up or developing into the frank cutaneous type. The determining factor as to which of these developments will occur is partly the degree of infection, but chiefly the general health of the child.

From the name one might suppose that juvenile leprosy is found commonly in young children. In my experience in India this is far from being the case. The more resistant type is probably equally or even more common, and being more conspicuous it is certainly far more frequently diagnosed. Juvenile leprosy is more commonly seen in homes for the children of

leprous parents, and in such institutions it is generally the most common type.

The recognition of juvenile leprosy is of extreme importance. There is good reason to believe that in an endemic area the majority of cases which in future life become infectious, and in turn transmit the disease to the next generation, belong initially to this class. My experience in Northern India shows that the great majority of those infected in adult life either recover or remain as uninfected cases.

The main problem in the control of leprosy is to prevent the infection of young children. In any community where this can be accomplished the disease is likely to become a negligible one within a single generation. The child with juvenile leprosy is a latent source of danger, and the insidiousness of the onset

and progress of this type makes it difficult to tell when such a child begins to become a danger to the community. The leprolin test is, in my experience, of great value in diagnosing such cases. Negative tests have not infrequently led to careful re-examination of such children with the result that numerous lepra bacilli have been found in the skin or nasal mucosa, although clinical signs were negative or only sufficient on careful inspection to excite suspicion.

As I have indicated above, the prognosis in juvenile leprosy, while it is influenced by the degree of infection, is still more dependent on the general health of the child. Likewise, while hydnocarpus injections in moderate doses are of use, by far the most important consideration in the treatment is the steady maintenance of a high degree of general health.

Reviews

A HANDBOOK OF TROPICAL THERAPEUTICS.—By R. N. Chopra, C.I.E., K.H.P., M.A., M.D. (Cantab.), M.R.C.P. (Lond.), Brevet-Colonel, I.M.S. 1936. Art Press, 20, British Indian Street, Calcutta. Pp. xxi plus 1748. Price, Rs. 25

In this book-ridden age it is seldom that one can find a real gap in the literature on any one subject. In the literature of tropical therapeutics there was, however, a very serious one; how serious was this gap will only be fully appreciated after reading Colonel Chopra's encyclopædic work on the subject. It is true that there is in this volume much that is not concerned with the therapy of diseases that are confined to tropical countries, but at least two-thirds deal with diseases that are mainly tropical in their distribution, and much of the rest with the treatment of universal diseases encountered under tropical conditions.

No one was more fitted to undertake the task of writing a book on this subject than Colonel Chopra, as fifteen years ago, with an established reputation as an experimental pharmacologist, he was appointed to the chairs of pharmacology at the Calcutta School of Tropical Medicine and at the Medical College, Calcutta, and during the subsequent years he has had unrivalled opportunities, of which it is obvious from his published works he has taken full advantage, for practical pharmacological investigation in his laboratories at the School and for the exercise of practical therapeutics in the wards of the Carmichael Hospital for Tropical Diseases. The reviewer therefore welcomed this volume with high hopes and in no way was he disappointed.

The author emphasizes in the preface that the work reported is by no means that of a single individual; such a thing would be impossible. Much of the work on therapeutics of tropical diseases that has been worked out by different members of the staff of the Calcutta School during the fifteen years of its existence, as well as that of workers in other countries, has been summarized in this book. In this connection, one section seems to demand special mention. The late Lieutenant-Colonel H. W. Acton, who was for some years director of the Calcutta School, acquired a great reputation as a dermatologist. It was always his intention to write a book on tropical dermatology, but the heavy duties connected with the directorship of the School delayed a project which his premature death ended. He had, however, left valuable notes with his assistants and two of these, Dr. L. M. Ghosh and K. P. Banerji, put these notes together into a form suitable for incorporation in this volume. This section covers about 80 pages and forms a very valuable and important part of the book.

The book is divided into eight parts: Part I deals with general considerations in therapeutics and includes

chapters on the action of drugs, conditions modifying drug action, modes of administration and details of technique, chemotherapy, physiotherapy, diet and dietetics in the tropics, the treatment of pain and insomnia, and the use of tonics. Part II deals with the treatment of helminthic diseases; this section is based on a book on this subject written by the author in conjunction with his one-time colleague, Dr. A. C. Chandler, but the matter had been brought completely up to date. Part III, dealing with remedies used against protozoal diseases, is composed of four sections; in the first he deals with remedies used against amebiasis, in the second with those against leishmaniasis and trypanosomiasis, in the third with those against malaria, and in the fourth with those against spirochetal diseases. This is the most important part of the book from the point of view of practical tropical therapeutics and the author's rich personal experience is reflected in every page. The relative values of the different drugs are discussed in great detail, as well as the mode of action of the various specifics, the toxic by-effects that may be expected, and the means of dealing with them. Part IV is devoted to bacterial and virus diseases, and the use and abuse of vaccines, sera, and bacteriophage in the treatment of diseases of this class that occur in tropical countries. Part V deals with metabolic and nutritional diseases, certain other diseases, such as infantile biliary cirrhosis, the ætiology of which is not clear but which are usually classed as nutritional disorders, with snake and insect venoms, and with drug addiction and its treatment. These are again subjects that the author has made his own and in which he has had a vast amount of practical experience, the results of which are well summarized in these chapters. Part VI is the section on skin diseases to which we have already referred. The next section is a dictionary of diseases and treatment; this covers three hundred pages and is in a way complementary to the rest of the book. Subjects that have not been discussed in other sections are included here, and there are frequent cross-references to earlier sections of the book. This section will be of special value to the practitioner in India and will enable him to use the book as a general textbook on medicine. The last part of the book consists of the appendices. Appendix I contains up-to-date information on subjects that have already been discussed in the early part of the book; it consists of extracts and reviews of important books and scientific papers. Appendix II consists mainly of tables of various kinds, e.g., a table of the bacteria pathogenic to man, with special reference to the tropics, a table of the distribution of important snakes in India, and a table of the caloric values and vitamin contents of food substances used in India [a most valuable table]; in the same appendix there is useful summarized information on arthropod vectors of disease in India, Indian scorpions, the food grains of India, edible oils,

and edible and poisonous fungi of India; there are a number of prescriptions based on the pharmacopœia of the Calcutta School of Tropical Medicine, a posological table, and a list of new and non-official remedies, and finally lists of hill stations and health resorts, and of the mineral waters of India. At the end of each section there is a very useful bibliography which will enable the reader to delve more deeply into the subject should he wish to do so.

The author has achieved his twofold object most remarkably well; he has produced a book that will become a standard reference book on tropical therapeutics throughout the world, and at the same time will be invaluable as a handbook on general medicine, with special reference to treatment, for the use of the student and practitioner in India. The latter class of reader may consider the price a little high, but he can be assured that he will get extraordinarily good value for his money; there are nearly eighteen hundred pages crammed full of invaluable information, and in any country in the world it would be impossible to produce a book of these dimensions at a lower cost. The book has not been extravagantly published, it is not printed on the heavy and expensive glazed paper that adds so considerably to the cost of production of a book, but on a good quality thin opaque, so that the reader is getting solid value for his money. The print is in a pleasing font, clear and easy to read, and there are few misprints; the binding is plain, strong and artistic; and in fact the whole format of the book reflects great credit on the publishers. We tender the author our sincerest congratulations for having brought to a most remarkably successful conclusion a colossal task.

DISEASES OF WOMEN.—By H. S. Crossen, M.D., F.A.C.S., and R. J. Crossen, M.D. Eighth Edition. 1935. The C. V. Mosby Company, St. Louis. Pp. xiv plus 999, with 1,058 engravings including 1 coloured plate. Price, \$10.00

THE eighth edition of this well-known book has been thoroughly revised and brought up to date. It is a formidable looking textbook of 999 pages divided into 22 chapters.

The arrangement of the book is pleasing and a great advance on former editions. The subject is presented to the student in the order in which it is taught. Firstly anatomy and physiology—then pathology followed by the clinical teaching. A sound foundation is assured before the clinical side is approached.

The subject-matter is easy to read and all important points are brought out with a clarity that is commendable. Illustrations and microphotographs are abundant and clear. The index is full and clear.

For the practitioner the book can be recommended as a complete study of gynaecology—both theoretical and practical. For the student—one wonders whether his requirements are met by a book of 999 pages. The last 100 pages containing surgical technique, after-treatment, diseases of the lower intestinal tract, medico-legal aspects, etc., are subjects that the student learns elsewhere and they could with advantage be omitted.

S. N. H.

A PRACTICAL HANDBOOK OF MIDWIFERY AND GYNÆCOLOGY.—By W. F. T. Haultain, O.B.E., M.C., B.A., M.B., B.Ch., F.R.C.S.E., M.R.C.P.E., F.C.O.G., and C. Kennedy, M.B., F.R.C.S.E., M.C.O.G. Second Edition. 1935. E. and S. Livingstone, Edinburgh. Pp. x plus 356. Illustrated. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 11-4

THIS small handbook has been brought up to date and forms a simple book of ready reference for practitioners. It is doubtful, however, whether concentrated and scantily illustrated books of this type are of value to students undergoing instruction.

S. N. H.

EXPERIMENTAL PHYSIOLOGY WITH ANATOMICAL AND MECHANICAL ILLUSTRATIONS AND AN APPENDIX OF TECHNICAL DATA.—By M. B. Visscher, Ph.D., M.D., and P. W. Smith, Ph.D. 1935. Henry Kimpton, London. Pp. 191. Illustrated with 75 engravings. Price, 15s.

THIS volume appears at a time when the methods of teaching are receiving a good deal of critical attention. The book describes the classical experiment suitable for the class room laboratory with necessary alterations and restrictions. The author does not claim originality in the majority of the experiments, except in certain minor alterations. The ground covered is fairly comprehensive. The practical directions are admirably lucid and complete and draw attention to various sources of error that must be avoided. Numerous illustrations of anatomical and mechanical features will be of great help to the students. The descriptions of the exercises should perhaps have been accompanied by a more detailed account of their theoretical implication, for example, a good account of the regulation of blood reaction and of Van Slyke's work would have been appreciated.

The appendix containing information regarding chemical methods and the preparation of materials, dosage of drugs, etc., should prove of great assistance to the student of physiology. The practical note is firmly struck and held throughout. The book is an excellent one within the limits set by its authors and will be of considerable value to teachers as well as to students.

R. N. C.

FAILURE OF CIRCULATION.—By T. R. Harrison, M.D. 1935. Baillière, Tindall and Cox, London. Pp. xii plus 396. Illustrated. Price, 20s.

AT Vanderbilt University Harrison and his associates have studied the problem of circulatory disorders on the laboratory animal as well as on patients in the hospital for more than ten years. The results have been published from time to time in various journals. The investigations are carefully edited and are presented in the present volume in an orderly and convincing manner. The work is really a defence of the 'back pressure' theory of congestive heart failure as opposed to the hypothesis of 'forward pressure'. Dr. Harrison's proof is advanced on the basis of a restudy from a physiological, pathological, chemical and physical point of view of many of the old questions involved. It is in respect to these that all the various lesions and conditions that may affect the heart are considered. Failure of the heart and its effect on the circulation are dealt with elaborately. Although much light has been thrown on the subject by recent investigation it is obvious that much remains to be discovered about the metabolism of the body as a whole, when failure of circulation is present. The complexity of the detail in an ever changing picture makes difficult a clear understanding of all the phases in the process. Among the major phenomena of congestive heart failure are discussed such subjects as enlargement of the heart, fatigue in enlarged hearts, oedema and dyspnoea. There are also considered minor cardiac symptoms such as cyanosis, arrhythmias and blood pressure, as well as symptoms in organs other than the heart. There is a short discussion of failure of the coronary circulation, special attention being devoted to angina pectoris. In the chapter on treatment the use of digitalis is considered, as well as the general management of cardiac disease in relation to its various stages. The summaries that are found at the end of many chapters and the figures and ingenious diagrams are among the helpful features of the book.

The scope of the book is limited and the author admits that there are gaps that must be filled by further investigation. It is in no way a treatise on heart disease. The clinicians however will find many hints as to diagnosis and treatment, that are to be commended.

R. N. C.

THE AUTONOMIC NERVOUS SYSTEM: ANATOMY, PHYSIOLOGY AND SURGICAL TREATMENT.—

By James C. White, M.D. 1935. Henry Kimpton, London. Pp. xvi plus 386. Illustrated. Price, 30s.

OPERATIONS on the autonomic nervous system are one of the most recent acquisitions to the domain of the surgeon. It consists of ganglia that are anatomically and functionally connected with the central nervous system through visceral efferent components of the cerebral and spinal nerves, and the nerves that arise in these ganglia. In this volume the author has gathered the fundamental contributions of the anatomist, physiologist and pharmacologist as well as neuro-surgeons. The book is very helpful to those who are interested in neurology and who are concerned in the application of neuro-physiology to disordered visceral functions and intractable pains. Surgery involving autonomic nerves has become a recognized procedure in the treatment of various diseases, particularly angina pectoris, congenital megacolon and disorders in which circulatory disturbances in the extremities are factors, and in the relief of certain types of obstinate pain. Such surgery implies exact knowledge of the anatomical relationships of the nerves in question. The author has spared no pains in order to make the approach to the subject lucid and of greatest practical value. The pharmacology of the autonomic nervous system is one of the most definitely known of all drug phenomena, as well as some of the most obscure ones and the subject is of interest from every angle of the practice of medicine. The publication of this work has made this difficult subject clear to a great extent and has added a great deal towards the appreciation of its difficulties.

The book is well written and should prove useful to the internists, neuro-surgeons and students who make a special study of neurology.

R. N. C.

A SYNOPSIS OF THE BRITISH PHARMACOPŒIA, 1932, AND OF THE POISON LAWS OF GREAT BRITAIN, NORTHERN IRELAND AND THE IRISH FREE STATE, INCLUDING THE 1936 POISON LIST AND RULES.—By H. W. Gadd. Thirteenth Edition. 1936. Baillière, Tindall and Cox, London. Pp. 200. Price, 3s.

THIS is the thirteenth edition of this small book and it has been produced so as to embody the new poison list and rules. It contains the usual tables of weights and measures followed by a complete list of the drugs of the *British Pharmacopœia* of 1932. These are arranged alphabetically and after the names are given the characters, imperial and metric doses in three columns with a column for remarks.

The last forty-five pages give a synopsis of the poison laws and rules of all the divisions in the British Isles. The volume is a handy pocket size and so can be carried conveniently for immediate reference, and as such is extremely useful. The last part of the book is of course of no use outside the British Isles, but a complete list of pharmacopœial drugs in such a handy form makes it worth the price of 3 shillings asked for it.

PHARMACOLOGY, MATERIA MEDICA AND THERAPEUTICS.—By C. Solomon, M.D. 1934. J. B. Lippincott Company, Philadelphia and London. Pp. xxvi plus 680, with 90 illustrations. Price, 12s. 6d. Obtainable from Butterworth and Company (India), Limited, Calcutta. Price, Rs. 9-6

LONG association with the nursing staff in the hospital has enabled Dr. Solomon to study the difficulties experienced by the nurses in following the dictates of physicians and surgeons alike regarding the treatment of patients in different units of the hospital. Undoubtedly there exists a mutual relationship between

the physician, the nurse and the patient and it is highly important that the nurse should familiarize herself with the terms frequently used by the physician. Much care has therefore been exercised by the author to include the technical terminology and all the formal requirements in nursing, materia medica and therapeutics, as required by the various State Board examinations and the National League of Nursing Education. The book has been divided into several important parts dealing with general pharmacology including a detailed systematic classification of different drugs, pharmacy including the art of dispensing, prescription reading, posology, metrology, etc.; toxicology including a classification of poisons, diagnostic features of cases of poisoning and their emergency treatment. The inclusion of a few chapters dealing with special therapeutics of diseases of the eye, ear, nose and throat, genito-urinary systems, skin, etc., is a valuable addition. The chapters on non-medicinal therapy dealing with dietotherapy, psychotherapy, physical therapy, hydrotherapy, balneotherapy and kinesiotherapy deserve mention. The section on the treatment of emergencies will undoubtedly enrich the knowledge of the reader. The concluding chapter on the course in practical pharmacology and materia medica contains important and valuable hints for the teaching staff. In short the book is complete in itself. The excellent illustrations will simplify many problems to the reader.

We congratulate the author and the publishers of this work which is well produced, clear and precise and pleasing to read. The book can be safely recommended to those for whom it is intended.

R. N. C.

THE EARLY DIAGNOSIS OF MALIGNANT DISEASE.

—By Malcolm Donaldson, F.R.C.S. (Eng.), M.B., B.Ch. (Cantab.), F.C.O.G., Stanford Cade, F.R.C.S. (Eng.), William Douglas Harmer, M.A., M.C. (Cantab.), F.R.C.S. (Eng.), R. Ogier Ward, M.Ch. (Oxon.), F.R.C.S. (Eng.), and Arthur Tudor Edwards, M.A., M.D., M.Ch. (Camb.), F.R.C.S. (Eng.). 1936. Oxford University Press, London. Humphrey Milford. Pp. viii plus 168. Price, 7s. 6d.

THIS instructive volume is the combined work of Messrs. Malcolm Donaldson, Stanford Cade, Douglas Harmer, Ogier Ward and Tudor Edwards, all of whom are on the staff of important London hospitals and also of the Mount Vernon Hospital, a special cancer centre at Northwood. This book is made particularly interesting by the fact that each chapter has been written by a specialist and every important point has been considered with characteristic precision and impartiality. There is no doubt that cancer is a curable disease, provided it is diagnosed early and treated efficiently. From the fact that more than 56,000 people die from cancer in the United Kingdom in a single year, it may be inferred that diagnosis is not made sufficiently early in the majority of these cases. The whole object of this small book is to remind the general practitioner of the essential points in making an early diagnosis of malignant disease.

The book consists of a general introduction and twelve chapters, of which, the first deals with the important subject of carcinoma of the mammary gland. The cardinal principles of diagnosis are emphasized: early cases do not present the typical textbook picture of cancer. Biopsy is essential, but it is preferable to carry it out with the diathermy needle. With regard to malignant disease in the female genital organs, which is dealt with in the next chapter, emphasis is laid on the fact that irregular hæmorrhage and post-menopausal bleeding are the commonest symptoms suggestive of malignancy. In the Ministry of Health Report no. 40, 1927, it is stated that on an average a period of six to nine months is allowed to elapse between the first occurrence of symptoms and the

patients' attendance at hospital. This means that rather less than one-half of the women, who apply for treatment, are at a stage when effective treatment is not practicable. Carcinoma of the cervix is by far the commonest type of malignant disease in women. It is important to remember that, in the early stage, there is very little difference between the appearance of carcinoma and erosion of the cervix.

The next two chapters, dealing with malignant disease of the tongue, mouth, lips, upper air passages and the oesophagus, should be read by every one. The chapter on the lungs and the mediastinum is equally instructive. Hæmoptysis in any patient after the age of 40 should be regarded with grave suspicion. It is unfortunate that malignant disease of the lung is relatively symptomless for a considerable period. Chapters VI to IX are devoted to the gastro-intestinal tract and are worthy of careful attention. Malignant diseases of the urinary system and the male genital organs are dealt with in chapter X. Carcinoma of the penis is an uncommon disease. It is related to phimosis and does not occur in those circumcized in infancy. The two concluding chapters deal with malignant diseases of the skin and of bone. Bone sarcomata can be grouped in four categories, *viz*: (i) osteogenic sarcomata; (ii) Ewing's tumour; (iii) giant-celled tumour and (iv) myeloma. It is emphasized that diagnostic biopsy is not permissible in case of osteogenic sarcoma.

In conclusion, we wish to congratulate the authors on their very valuable and timely publication and we warmly commend it to the notice of the general practitioner for whom it is primarily intended. The printing and get-up are excellent. An adequate index is also appended.

P. N. R.

THE MEDICAL TREATMENT OF GALL-BLADDER DISEASE.—By M. E. Refhuss, M.D., and Guy M. Nelson, M.D. 1935. W. B. Saunders Company, Philadelphia and London. Pp. 465. Illustrated. Price, 24s.

Quite a large percentage of the population suffer from some form of upper abdominal trouble of which the commonest cause is gall-bladder disease. Surgical interference is resorted to in almost all suitable cases, but it has its own limitations. Such treatment is not always a cure-all method and then there are some persons who will not submit to operation or are unsuitable on account of functional disturbances. Moreover gall-bladder diseases are not always associated with stones and such cases of stoneless pathological gall-bladders do not show any improvement by surgery. Coming in contact with quite a large number of cases in which surgery is not indicated, for some reason or other, the authors have been impelled to work out a line of medical treatment. The commonest causes of gall-bladder trouble are some metabolic disturbance leading to increased cholesterol content of blood, some form of infection and lastly stasis. The first principle of medical treatment however consists in relief of symptoms. The underlying causative factors are dealt with later on. The authors deal with this by means of dietetic management, glandular therapy, physiotherapy, etc. As regards the treatment of gall-stone cases the authors emphasize the importance of prophylaxis with a view to altering the nature of bile by dietary means. Duodenal drainage, physical measures and medicinal therapy have also received due consideration. In a volume like this it is not possible to do full justice to this vast subject, but we congratulate the authors for their attempt to bring forth the details with clearness and accuracy. The methods of diagnosis are very elaborately put down and the book is illustrated with beautiful diagrams. The book is worthy of critical consideration and we recommend it to the practitioner.

R. N. C.

THE BIOLOGY OF THE INDIVIDUAL: AN INVESTIGATION OF THE MOST RECENT ADVANCES. (THE PROCEEDINGS OF THE ASSOCIATION FOR RESEARCH IN NERVOUS AND MENTAL DISEASE. VOLUME XIV OF A SERIES OF RESEARCH PUBLICATIONS.)—Edited by J. R. Hunt, M.D., T. K. Davis, M.D., and A. M. Frantz, M.D. 1934. The Williams and Wilkins Company, Baltimore. Pp. xv plus 323, with 48 figures and 21 tables. Price, 27s. Available from agents:—Messrs. Baillière, Tindall and Cox, London.

The book is mainly based on the proceedings of the fourteenth annual meeting of the Association for Research in Nervous and Mental Disease. The incidents in the evolution of the individual have been evaluated critically in the present volume, the contributions being made by various writers who are masters in their respective fields. This rare combination of talents has rendered them admirably fitted for the task and this volume provides the reader with a clear, authoritative and reasonably detailed picture of life in its manifold forms and it should awaken a wide interest in the biological aspect of medicine. Even if the details are not complete in places, the book represents, without being cumbersome, a fairly good picture of the totality which we recognize by such expressions as individuality and personality. The rational discussion begins with an historical note on constitution and individuality. Then follows the morphological form and its relation to reflex action. The ontogenetic patterning of infant behaviour is very interesting, and the effects of glandular activity on constitution is properly evaluated and well summarized. The complex field of personality and its relationship to psychology and sociology has been dealt with in a masterly manner.

The book is interesting from beginning to end. Throughout, it is illustrated with various scientific expositions of which the significance is always discussed fully and impartially and it should form a valuable scientific background for those undertaking the study of neurology and psychiatry.

R. N. C.

PRESCRIPTION WRITING AND FORMULARY. THE ART OF PRESCRIBING.—By C. Solomon, M.D. 1935. J. B. Lippincott Company, Philadelphia and London. Pp. xx plus 351, with 32 illustrations. Price, 21s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 15-12

It has not been wrongly said that a prescription is to a physician what a knife is to a surgeon and an ophthalmoscope to an ophthalmologist. The art of prescription writing will always be of great interest to a physician. It is his effort to select the most effective drugs and to find out means by which he may be able to make a potion less bulky, attractive, least unpalatable, and easy of administration, and at the same time not less quick in action. The prescription is an understanding, clear and definite, between a physician and the dispensing chemist and at the same time it is to be written in simple and clear English so that the patient may be able to understand how to use it.

The polypharmacy and the 'shot gun' prescription are to be deprecated and are out of date. The prescription should contain as few drugs as possible and should have no incompatibilities.

As a lecturer in materia medica and assistant clinical professor of medicine the author has had a good deal of experience in connection with the medicines, prescriptions and the needs of the patients. He understands the difficulties met by the prescribing physician and the common errors usually committed by students. All these points have been very well kept in view by the author. The book is divided into three parts dealing with the theory, history and the general considerations in the art of prescription writing. The mode of administration, sterilizing and care of the syringe and

THE AUTONOMIC NERVOUS SYSTEM: ANATOMY, PHYSIOLOGY AND SURGICAL TREATMENT.—By James C. White, M.D. 1935. Henry Kimpton, London. Pp. xvi plus 386. Illustrated. Price, 30s.

OPERATIONS on the autonomic nervous system are one of the most recent acquisitions to the domain of the surgeon. It consists of ganglia that are anatomically and functionally connected with the central nervous system through visceral efferent components of the cerebral and spinal nerves, and the nerves that arise in these ganglia. In this volume the author has gathered the fundamental contributions of the anatomist, physiologist and pharmacologist as well as neuro-surgeons. The book is very helpful to those who are interested in neurology and who are concerned in the application of neuro-physiology to disordered visceral functions and intractable pains. Surgery involving autonomic nerves has become a recognized procedure in the treatment of various diseases, particularly angina pectoris, congenital megacolon and disorders in which circulatory disturbances in the extremities are factors, and in the relief of certain types of obstinate pain. Such surgery implies exact knowledge of the anatomical relationships of the nerves in question. The author has spared no pains in order to make the approach to the subject lucid and of greatest practical value. The pharmacology of the autonomic nervous system is one of the most definitely known of all drug phenomena, as well as some of the most obscure ones and the subject is of interest from every angle of the practice of medicine. The publication of this work has made this difficult subject clear to a great extent and has added a great deal towards the appreciation of its difficulties.

The book is well written and should prove useful to the internists, neuro-surgeons and students who make a special study of neurology.

R. N. C.

A SYNOPSIS OF THE BRITISH PHARMACOPOEIA, 1932, AND OF THE POISON LAWS OF GREAT BRITAIN, NORTHERN IRELAND AND THE IRISH FREE STATE, INCLUDING THE 1936 POISON LIST AND RULES.—By H. W. Gadd. Thirteenth Edition. 1936. Baillière, Tindall and Cox, London. Pp. 200. Price, 3s.

THIS is the thirteenth edition of this small book and it has been produced so as to embody the new poison list and rules. It contains the usual tables of weights and measures followed by a complete list of the drugs of the *British Pharmacopoeia* of 1932. These are arranged alphabetically and after the names are given the characters, imperial and metric doses in three columns with a column for remarks.

The last forty-five pages give a synopsis of the poison laws and rules of all the divisions in the British Isles. The volume is a handy pocket size and so can be carried conveniently for immediate reference, and as such is extremely useful. The last part of the book is of course of no use outside the British Isles, but a complete list of pharmacopoeial drugs in such a handy form makes it worth the price of 3 shillings asked for it.

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Quite a large percentage of the population suffer from some form of upper abdominal trouble of which the commonest cause is gall-bladder disease. Surgical interference is resorted to in almost all suitable cases, but it has its own limitations. Such treatment is not always a cure-all method and then there are some persons who will not submit to operation or are unsuitable on account of functional disturbances. Moreover gall-bladder diseases are not always associated with stones and such cases of stoneless pathological gall-bladders do not show any improvement by surgery. Coming in contact with quite a large number of cases in which surgery is not indicated, for some reason or other, the authors have been impelled to work out a line of medical treatment. The commonest causes of gall-bladder trouble are some metabolic disturbance leading to increased cholesterol content of blood, some form of infection and lastly stasis. The first principle of medical treatment however consists in relief of symptoms. The underlying causative factors are dealt with later on. The authors deal with this by means of dietetic management, glandular therapy, physiotherapy, etc. As regards the treatment of gall-stone cases the authors emphasize the importance of prophylaxis with a view to altering the nature of bile by dietary means. Duodenal drainage, physical measures and medicinal therapy have also received due consideration. In a volume like this it is not possible to do full justice to this vast subject, but we congratulate the authors for their attempt to bring forth the details with clearness and accuracy. The methods of diagnosis are very elaborately put down and the book is illustrated with beautiful diagrams. The book is worthy of critical consideration and we recommend it to the practitioner.

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needles, posology and incompatibilities have been extensively dealt with. A large number of formulæ, English and Latin vocabularies, organotherapy and bibliography have also been appended.

The book is recommended to medical students, general practitioners and pharmacists as a book of reference for everyday use.

R. N. C.

DISEASES OF THE EAR, NOSE AND THROAT. (CATECHISM SERIES.)—Revised by W. S. Syme, M.B., F.R.F.P.S. Second Edition. E. and S. Livingstone, Edinburgh. Pp. 68. Price, 1s. 6d. Postage, 2d.

Books of the Catechism Series are sufficiently well known not to require any introduction. This small volume has been compiled in the form of questions and answers. Consequently it is likely to command a certain amount of popularity. Considering the small size of the book, it is remarkable that very little of importance has been left out. The chief objection to books of this type, is that, they are liable to encourage the reprehensible habit of cramming. Used intelligently, this book is likely to be of some use to the examinee for the purpose of rapid revision of a special subject.

P. N. R.

SIMPLE KEY FOR THE IDENTIFICATION OF ANOPHELINE LARVÆ FOUND IN THE SIBSAGAR DIVISION, ASSAM. Tables arranged by Dr. D. Mason and Dr. L. R. Dey, Cinnamara Central Laboratory, Assam

THIS publication consists of five tables which are well arranged and have the advantage of presenting a good many of the diagnostic points in the form of a one-point key, instead of the usual wholly dichotomous keys.

It should prove of great value to workers in the area for which it has been compiled.

A TEXTBOOK OF GENERAL BACTERIOLOGY.—By Edwin O. Jordan, Ph.D. Eleventh Edition. 1935. W. B. Saunders Company, Philadelphia and London. Pp. 825. Illustrated. Price, 25s.

As a textbook for students of bacteriology the popularity of this book is well deserved and is reflected in the production of its eleventh edition. The general arrangement follows the usual plan adopted in textbooks on bacteriology and it is difficult indeed to find faults with a book of such established reputation. The text has been thoroughly revised and in it is contained much useful information in a readily accessible form which makes this book particularly valuable to the advanced students of bacteriology.

C. L. P.

HANDBOOK OF BACTERIOLOGY.—By J. W. Bigger, M.D., Sc.D. (Dub.), F.R.C.P.I., D.P.H., M.R.I.A. Fourth Edition. 1935. Baillière, Tindall and Cox, London. Pp. xvi plus 458, with 5 coloured and 93 other illustrations. Price, 12s. 6d.

We recently reviewed the third edition of this book and the appearance of another edition within four years of its predecessor is an indication of its popularity. This is one of the very few textbooks on bacteriology which has not increased in size and still retains a form well suited for the medical student. It is concisely written, clear, comprehensive and contains a straightforward account of the essential facts. The recent advances in the subject have been incorporated in this edition. The medical student has a vast number of textbooks on bacteriology from which to make his selection and often this is no easy task. This is one of the few that can be confidently recommended.

C. L. P.

A TEXTBOOK OF BACTERIOLOGY.—By T. B. Rice, A.M., M.D. 1935. W. B. Saunders Company, Philadelphia and London. Pp. 551, with 119 illustrations. Price, 21s.

THIS is one of the shorter textbooks of bacteriology which supplies all the real fundamentals necessary for a student. The classification and nomenclature is based on the modern system, the old nomenclature is also given. The chapters on filtrable viruses, immunity, bacterial virulence, toxin, antitoxins and agglutinins are particularly good for the concise and comprehensive way in which these subjects have been dealt with.

The inclusion of the more important pathogenic protozoa in a small chapter will be appreciated by the busy practitioner though it is inadequate for the needs of a medical student in the tropics. The five appendices at the end of the book contain some very useful summaries and information which will prove of very great help.

C. L. P.

PATHOLOGY.—By James Miller, M.D., F.R.C.P.E. Parts I and II. Fourth Edition. (Catechism Series.) 1935. E. and S. Livingstone, Edinburgh. Pp. 152. Illustrated. Price, 1s. 6d. each part, Postage, 2d.

For a student who has completed an undergraduate course in pathology and who wishes to refresh his memory on important technical points these two volumes have many advantages. They are written in a concise and clear manner and the information contained in them covers the whole field of pathology required by a medical student.

There is a tendency by teachers to discourage the use of books of this type. This is based on the fear that the student might be tempted to regard these compact volumes as substitutes for lecture notes or textbooks. An inherently lazy student might do so and there is nothing to prevent such a student taking the 'easy path', but an intelligent student will use these books as valuable aids in his understanding of the matter contained in his textbook. It is easier, we venture to think, to write large textbooks, but more difficult to summarize in a few pages all the important points in a subject, and in this the Catechism Series to which these two little volumes belong have succeeded very well. We would encourage the intelligent use of these booklets by students of pathology.

C. L. P.

CHRONIC STREPTOCOCCAL TOXAEMIA AND RHEUMATISM.—By J. D. Hindley-Smith, M.A., M.R.C.S., L.R.C.P. 1935. H. K. Lewis and Company, Limited, London. Pp. xi plus 276. Price, 7s. 6d.

As the author points out in the preface, this book has appeared at a time when medical attention is being focused upon the ætiology of chronic rheumatism and allied disorders. In it Dr. Hindley-Smith advances, with much logical reasoning, a claim for the study of those ailments which do not correspond to textbook disease entities. Certainly it is becoming increasingly common for persons with vague and chronic disorders 'untabulated and falling into none of our preconceived definitions of disease' to present themselves for treatment, and requiring careful and laborious investigation before a precise diagnosis can be arrived at. Those called upon to treat such cases will find in this book much with which he is in agreement and much that will help to solve his difficulties.

An hypothesis is very convincingly advanced by which it is shown that most chronic unknown ailments are due to an acid toxæmia. That this is brought about by chronic poisoning of the human organism by toxins of such a nature that its reactions use up the alkali reserve of the tissues, and cause a shifting of the pH value towards acidity of all the cells and secretions of the body excepting the blood stream. Its causes are many and various and range from worry,

fatigue and excessive tobacco smoking to liver disturbances and absorption into the blood of toxins from septic foci, or from tissues suffering from chronic bacterial infection, chief among these being the streptococci causing what the author has called 'C. S. T.' or chronic streptococcal toxæmia.

This condition, on account of its insidious onset, is very difficult to diagnose. It may commence early in life and may continue with fluctuations through middle age up to the commencement of old age, by which time severe effects have been produced. The commonest among these being chronic rheumatism.

Detailed clinical and bacteriological features are described of the three stages of the disease (chronic streptococcal toxæmia). Commencing with the delicate looking child subject to colds and chronic catarrh, etc., in the first stage of 'C. S. T.', the author follows the child through the age of adolescence and early manhood with his 'weak throat', chronic disorders of the alimentary system, sluggish liver and a tendency towards intermittent lumbago, sciatica or neuritis in the second stage of the disease, to the individual of forty and over with chronic nodules, swollen, painful and stiffened joints and the wasted muscles of chronic rheumatism.

Together with this description much stress is laid upon the bacterial examination of the throat swab and the family history of the case, for the diagnosis of the condition. He states that a series of swabs taken from the throat of a healthy individual at stated intervals will show within a narrow margin the same reading throughout the series, and by logical reasoning leads the reader to his conclusion that 'Throat swabs taken from the nasopharynx.....' are the pharyngeal index of immunity. For this the percentage ratio of streptococci to the total bacterial flora of the throat must be estimated. The normal varies from 2 to 10 per cent whereas in the case of 'C. S. T.' the percentage will vary from 40 to 100.

The author advances a theory to meet the natural question which rises in the reader's mind, *viz.*, why are not antibodies produced which will immunize the patient against the disorder, especially as the disease is comparatively mild and its progress slow? He postulates that toxins which pass into the blood in minute quantities, through the damaged tissues of the septic focus, do not excite the production of antibodies, whereas when these pass through healthy tissue, a hormone is liberated which sensitizes the blood in such a way that antibodies are formed.

Treatment of chronic rheumatism therefore consists of increasing the patient's general resistance, promoting toxin elimination, especially through the skin, and the stimulation of antibody formation by means of vaccines.

The book endeavours and we think succeeds in presenting to the profession a conception of chronic ailments which is thought provoking and stimulating. The author is to be congratulated on his endeavour.

C. L. P.

IMMUNOLOGY.—By N. P. Sherwood, Ph.D., M.D. 1935. The C. V. Mosby Company, St. Louis. Pp. 608. Illustrated. Price, \$6.00

This is a work that will appeal to all students of immunology, a subject of immense importance not only to the medical undergraduate but also to all practitioners of medicine. This book deals with the various problems in immunology in a simple, straightforward manner, and is not overburdened with the various theories that have been advanced from time to time and which make this subject far more complex than it need be, and which is responsible for keeping many students ignorant of some of the important principles in the science of immunology.

In this book will be found a general review of the whole subject in all its aspects. Throughout the book standard techniques are presented, analysed and discussed. A very useful chapter on colloids is

introduced just before the chapters that deal with the mechanisms involved in agglutination, sensitization to opsonins and complement fixation. A useful bibliography is given at the end of each section.

C. L. P.

THE BACTERIOLOGY OF TYPHOID, SALMONELLA AND DYSENTERY INFECTIONS AND CARRIER STATES.—By L. C. Havens, M.D. Edited by K. F. Maxcy, M.D. Oxford University Press, Bombay and London. The Commonwealth Fund, New York. Pp. xii plus 158. Price, 7s. 6d.

This is one of the most useful little books that we have seen for some time. It deals with one of the most important groups of organisms that are responsible for a large amount of morbidity and mortality in the tropics. There is a comprehensive discussion of the bacteriology of the typhoid-salmonella dysentery group of organisms with complete and exact details as to the methods of their recovery and identification.

The book is divided into thirteen chapters, the first three chapters give a general introduction to the rest of the book, which is essentially of a practical nature. The antigenic composition and the variation of bacteria is dealt with in such a way as to make the understanding of this difficult subject comparatively easy. Chapters IV to VII deal with the preparation of culture media and methods of isolation and identification of intestinal pathogens. There are many practical hints which will be of value to all concerned with the isolation of intestinal pathogens.

Chapters VIII to XI are devoted to the typhoid-salmonella group of organisms and are essentially of a practical nature. Chapter IX deals with the typhoid carrier problem and the organization and management of a typhoid carrier survey. The last two chapters deal with the dysentery group and the laboratory methods of diagnosis.

In a book of this type there are many points in which laboratory workers will differ in the relative importance that can be attached to them, but these are the very points that make one ponder over, revise and bring up to date the laboratory methods that are employed in the investigation of diseases caused by these organisms.

This is a book that should be in the hands of every medical practitioner who wants to have a real working knowledge of the bacteriology of these diseases of major importance in the tropics. To a laboratory worker this volume will give many useful practical hints and stress the importance and the necessity of collaboration between the clinician and the laboratory worker.

C. L. P.

DISEASES OF THE SKIN.—By F. C. Knowles, M.D. Third Edition. 1935. Henry Kimpton, London. Pp. 640, with 240 illustrations and 11 plates. Price, 30s.

This may be classed as one of the medium-sized books on diseases of the skin of which there are many. It gives the impression that the author has tried to compress too much into the 600 odd pages it contains. For instance it seems unnecessary to deal with general diseases in which a skin eruption is only one and very often the least important sign. One surprising inclusion in this section is malaria in which 'Fever blisters are of common occurrence and of favourable import'. Statements of this kind are quite useless to a dermatologist and only add to the size of the book without increasing its value.

Many of the statements in the section on parasitic diseases, especially those dealing with animal parasites of the tropics, are somewhat misleading and have been obviously hurriedly compiled from somewhat out of date and unreliable sources. It is admitted that most of these diseases are not of great importance but it is felt that this fact is no excuse for describing them inaccurately and imperfectly.

The sections dealing with true skin diseases are much better, that on eczema and allergy especially being an excellent summary of recent work and opinion on this difficult subject.

There are no coloured plates, practically all the illustrations being reproductions of photographs; some of them are excellent, whereas others are of little educational value.

On the whole the book may be described as a useful short textbook on skin diseases, but one feels it would be of greater value if the author confined himself to skin diseases *sensu strictu* and left out those diseases in which a skin rash is only a purely symptomatic manifestation.

THE STUDY OF ANATOMY.—By S. E. Whltnall, M.A., M.D., B.Ch. (Oxon.), M.R.C.S., L.R.C.P., F.R.S. (Canada). Third Edition. 1936. Edward Arnold and Company, London. Pp. 113. Price, 4s. 6d.

P. A. M.

THE book in its present edition embodies a mine of information for the undergraduate as well as for post-graduate students of anatomy as to how a difficult and indispensable basic science has to be tackled without affront to the average brain and physique. For teachers on the subject the book will also prove useful in showing how to steer the undergraduate through this difficult part of his course till he reaches the clinical wards. Of particular interest are a few select lines on pages 27/28-31, 35, 45, 58 and 90. We fully agree with the author when he stresses the importance of broadening one's outlook by collateral general reading and he gives a list of well-known authors whose writings which are still malleable. Lastly if the golden advice never fail to make an abiding impression on minds in italics on page 71, and the scheme of study outlined in this admirable book written by one of the most impressive writers and teachers on the subject of anatomy, were to be followed by every student, the subject will lose all its age-old dread, dissection all its drudgery, memorization of the basic facts all its monotony and even the very bones will cease to be dead and appear endowed with life. The author also gives his views regarding the recommendations of the Curriculum Committee of the G. M. C. for the teaching of anatomy.

N. C.

THE SANITARY INSPECTORS' HANDBOOK. A MANUAL FOR SANITARY INSPECTORS AND OTHER EXECUTIVE PUBLIC HEALTH OFFICERS.—By H. H. Clay, F.R.San.I., F.I.S.E. With an Introduction by W. W. Jameson, M.A., M.D., F.R.C.P., D.P.H. (Lond.), etc. Second Edition. 1936. H. K. Lewis and Company, Limited, London. Pp. xxii plus 432, with 95 illustrations. Price, 15s.

This book is divided into 31 well selected chapters (with 95 illustrations) covering the extremely diverse duties for which the present-day sanitary inspector is responsible; each chapter commences with a summary of the law so far as it concerns that officer in respect of the subject-matter of the chapter. The inspection of premises is dealt with in detail and an example is given of the procedure in conducting such an inspection. The chapters on housing will be found of great value to all public health officers engaged in this work, as they set out clearly the chief requirements. Details of the methods available for the disinfection of premises are given. Chapters are included dealing with the composition, description, protection and preservation of food; also one on meat inspection together with much useful practical information on comparative anatomy and the diseases and conditions that may be met within the course of the inspection of carcasses for food. Details of the examination of fish are also described.

The second edition of this book has been brought up to date and includes most recent legislation, together with the corresponding rules and regulations issued by

the Ministry of Health. The text is liberally illustrated to assist the reader in technical matters and the illustrations are for the most part clear and can be readily followed.

The book may prove useful for the sanitary inspectors of towns like Calcutta and Bombay where problems of housing, drainage, food control, meat and fish inspection, slaughter houses, infection and disinfection, offensive trades and smoke abatement are to some extent similar to the towns in England. The book is based on conditions prevailing in English towns where climatic conditions are quite different from the tropical towns of India.

The last chapter on vital statistics is dismissed in two pages, but the chapters on drainage, hygiene of buildings and meat inspection are fully dealt with. The price of the book is too high to make it popular in India.

G. L. B.

PAINFUL AND DANGEROUS DISEASES OF THE EAR. A TEXTBOOK FOR STUDENTS AND GENERAL PRACTITIONERS.—By R. R. Woods, M.B., F.R.C.S.I. 1936. Oxford University Press, Bombay and London. Pp. vi plus 188. Illustrated. Price, 15s.

THE subtitle of this book is 'A textbook for students and practitioners' and Mr. Woods is to be congratulated on having produced just such a book to fill a long felt need.

The medical curriculum is so crowded that it is difficult to make a student take any interest in diseases of ear, nose and throat and more especially the ear, but he has not been a medical practitioner for many weeks before he is forced to realize the importance of painful diseases of the ear and this book will give him just the information that he wants. The necessary instruments are illustrated. They are few and inexpensive. How to use them is described in detail and here again there are numerous photographs to emphasize the various points. The electric otoscope is the most expensive item but it is in our opinion a necessity. There are many models in the market. (The one illustrated is not we think the best. Bausch and Lomb produce a better model as it allows more room for using instruments through it.)

In chapter III methods of examination are described in detail and fully illustrated.

The student is urged to get familiar with the normal external meatus and drum. We would go a step further and urge him to examine the normal ear *first* in all cases of unilateral ear disease. Thus he will get an idea of what is normal for that particular individual. Chapter IV is a useful one devoted to syringing and cleaning.

Part II. Uncomplicated inflammations. Under the heading of acute otitis externa, only furuncle is discussed. Otomycosis should have been mentioned. It is an uncommon disease in Great Britain but it can cause enough discomfort to deprive a patient of sleep and ordinary antiseptic treatment is useless. The author next discusses the differential diagnosis of earache; then acute otitis media in infants, and lastly chronic suppurative otitis media.

Part III is devoted entirely to acute mastoiditis. Part IV deals with intracranial complications and finishes up with a useful chapter on the cerebro-spinal fluid.

The outstanding feature of the book is the appendix in which the coloured drawings are collected. They comprise 24 coloured plates of actual conditions of the tympanic membrane. They are the work of a lady who is not only a talented artist but also a medical graduate. These drawings are, we imagine, responsible for the rather high price of the book but we think it is worth it.

The book itself maintains the high standard of the publications of the Oxford University Press.

H. S. C.

BACTERIAL ENDOCARDITIS.—By C. Bruce Perry, M.D. (Bristol), M.R.C.P. (Lond.). With an Appendix on an Experimental Study of Malignant Endocarditis. By D. M. Lloyd-Jones, M.D., M.R.C.P. 1936. John Wright and Sons Limited, Bristol. Pp. 137. Illustrated. Price, 10s. 6d.

THIS is an admirable handbook on one of the thorny problems in medicine, viz, bacterial endocarditis. It deserves the highest commendation as it has fulfilled, to some extent, the purpose of the munificent gentleman who dedicated his money for the advancement of the cause and cure of this serious malady.

The subject-matter has been dealt with in eleven chapters which contain all the necessary up-to-date information about the various aspects of the disease. Particular mention should be made about the masterly elucidation of the morbid anatomy and ætiology of the condition, illustrated by beautiful diagrams and photomicrographs from actual specimens. The pathogenesis of Osler's nodes has been fully discussed. The chapters on the bacteriology and hæmatology of the disease may be read with considerable benefit by everybody interested in the subject, whether in the laboratory or in the field of medical practice. We are pleased to find that the writer has discussed the question of treatment very briefly, and frankly confessed that it is of very little avail in a disease in which there is still so much to be solved. An exhaustive but well chosen bibliography will be highly appreciated by workers on the subject.

The fascinating portion of the book, however, is the appendix embodying the results of experimental production of the disease in laboratory animals. We are fully in agreement with the writer that any attempt at prevention and treatment of this disease must depend, to some extent, on the case with which the disease-process can be initiated and maintained in convenient laboratory animals. Workers on experimental pathology will find many valuable suggestions in this chapter.

It has become extremely difficult for us to criticize such an admirable book. During our perusal, however, a few inaccuracies have been met with; for instance on page 39, under other organs, 'Stratified characteristics' in endothelial cells, on page 40, 'peripheral manifestation result', on page 82, 'circulatory blood, etc.'. These are only minor matters which, in no way, mar the merit and quality of this very excellent production.

M. N. D.

THE TUBERCULIN HANDBOOK.—By H. Sutherland, M.D. 1936. Oxford University Press, Bombay and London. Pp. 96. Illustrated. Price, 7s. 6d.

OF all therapeutic substance tuberculin appears to be most susceptible to the vagaries of fashion; first acclaimed as the salvation of the human race, it was later condemned as being so dangerous that its use was almost prohibited. Even to-day, after it has been used extensively for fifty years, there is little agreement as to the most suitable cases in which it should be used, as to which is the best form of tuberculin to use, as to how it should be given, and as to whether it should be given at all in many forms of pulmonary tuberculosis.

Whilst admitting that it is a controversial subject, the author says that, as the book is written for students and practitioners, he has avoided controversy. To avoid controversy in a controversial subject must mean that you state your own case and ignore other people's. Though for the teaching of students it may be justifiable to adopt a dogmatic attitude, it is offering an insult to the intelligence of the post-graduate student to maintain it in his presence, unless you admit the existence of contrary opinions but choose to state the case entirely from your own point of view. This is what Dr. Halliday Sutherland has done, and he has produced a very valuable book.

Whilst one cannot help feeling that he is being optimistic in his claims for the value of tuberculin in certain pulmonary cases, one sees why it has failed in the hands of certain doctors who seem to think that it can be given as casually and with as little forethought as a dose of salts. In the hands of fools, and also in the hands of those who will not take the trouble to act as other than fools, it is a very dangerous therapeutic agent. For this reason we very strongly recommend anyone who is proposing to treat (or diagnose, as the author has given one of the best descriptions of the technique and interpretation of the Mantoux that we have ever read) a patient suffering from tuberculosis (or suspected to be suffering from tuberculosis as the case may be) to purchase and read very carefully indeed this book; we certainly do not know a better one of its kind. It is a book that we have no hesitation in recommending to the specialist and the intelligent practising physician.

L. E. N.

THE DIAGNOSIS AND TREATMENT OF PULMONARY TUBERCULOSIS. A HANDBOOK FOR PRACTITIONERS—A TEXTBOOK FOR STUDENTS AND NURSES AND SOCIAL WORKERS.—By J. B. Hawes, M.D., and M. J. Stone, M.D. 1936. Henry Kimpton, London. Pp. 215. Illustrated with 43 engravings. Price, 12s. 6d.

THE avowed object of the authors was to write a 'short but authoritative' book on pulmonary tuberculosis. They have certainly succeeded in giving a short, concise and very readable account of the treatment and diagnosis of this disease, but 'authoritative' is a relative term, and just how authoritative the reader considers the book to be will depend on how far his opinions coincide with those of the writers.

The first chapter contains a short historical account of tuberculosis of the lungs and the earliest attempts at treating the condition. It is interesting that the authors refer to Koch's discovery of the tubercle bacillus as marking 'the beginning of a rational and intelligent campaign against consumption', and yet about 90 per cent of what is written in this book could have been written without the knowledge that a bacillus is the cause of the disease. There are then four chapters on history-taking and the physical examination of the patient. Chapter VI is on the differential diagnosis and chapter VII on pulmonary tuberculosis in children. It is not quite clear why these two chapters were not placed after, instead of before, the next two, which are, respectively, on x-ray and laboratory method of diagnosis.

It is into the next three chapters that the authors have really put their hearts; these chapters are on sanatorium treatment, the treatment of symptoms and complications, and on collapse and compression treatment. Two chapters on heliotherapy and climatic influence in treatment follow, and then the most perfunctory chapter on specific treatment that it is possible to imagine. Tuberculin is dismissed out of hand and the fact that gold preparations have been used at all is grudgingly admitted, but in a way that is calculated to frighten anyone from even making further enquiries on the subject. There is a chapter on diet and another six on various subjects, all important in their way, such as rehabilitation, and consumption in the aged.

There are many points about this book that appeal to the reviewer; the skiagrams that are given are particularly well selected and those showing non-tuberculous conditions that might lead to mistakes being made are very instructive; the chapters on physical examination are also very good. On the other hand the authors' attitude towards tuberculin in both diagnosis and treatment strikes the reviewer as being extreme.

On the whole, the book is one that the reviewer feels that he can recommend to both the student and the practitioner, and it is a book that would make an excellent companion volume to the one on tuberculin

reviewed above, but he does not think that either Professor Möllgaard or Dr. Halliday Sutherland will consider it 'authoritative'.

L. E. N.

OTHER BOOKS RECEIVED

Constructive Eugenics and Rational Marriage. By Morris Seigel, M.D. 1934. McClelland and Stewart,

Limited, Toronto. Pp. xiii plus 196. Illustrated. Price, \$2.50

Ideal Birth: How to get the Finest Children. By Th. H. van De Velde, M.D. 1935. William Heinemann (Medical Books) Limited, London. Pp. xiv plus 296. Price, 10s. 6d.

Injection Therapy. By D. R. Prem, M.R.C.S. (Eng.), L.R.C.P. (Lond.). 1936. Published by Ratan Publishing House (Hindu Colony, Bombay, 14). Pp. 152. Price, Rs. 2-12

Abstracts from Reports

(1) HOWRAH HEALTH BOOK, (2) A NOTE ON TWENTY-NINE MUNICIPALITIES OF BURDWAN DIVISION, (3) GENERAL REPORT ON ONE HUNDRED AND SEVEN RURAL HEALTH CIRCLES OF BURDWAN. BY DR. G. L. BATRA, D.P.H., ASSISTANT DIRECTOR OF PUBLIC HEALTH, BURDWAN CIRCLE

VERY few people really appreciate the value of facts and figures. The collection and presentation of those in the form of tables and reports are classed in many people's minds as 'statistics', a term conveying opprobrium and suspicion rather than interest and appreciation, and giving the impression that such things are not matters for notice or study by common men, but are for specialists and peculiar people who by some twist in their mental make-up take an interest in them. Nevertheless they are greatly mistaken. Facts and numbers conscientiously collected, properly grouped and presented simply and interestingly are the milestones and signposts of progress. They show us what road we are on, in what direction we are going, and our rate of travel on the public highway. The traveller who cannot read such signposts or who neglects to look at them and profit by the information given on them, is regarded as neither wise nor intelligent. And moreover, the wayfarer feels their need when they are not provided. In public health work, reports of conditions, descriptive and numerical, have time and again been the means of arousing public interest and opinion and of stimulating nations and communities to concerted action for the betterment of the people's health and welfare. Notable examples in England have been the 'Report on the Condition of the Working Classes of England' in 1831 and the 'Report on Local Self-Government in England' in 1869. Indeed the first real advance in England was made by the publication of 'Bills of Mortality' in 1666 by John Grant. These were simply compilations of causes of deaths as recorded in the parish registers of the time. But they attracted great attention and interest. A report on the causes of the high mortality in the civil and military populations in India published in 1863 is still interesting reading. In India, however, the general public and the man in the street have never taken or shown any great interest in such matters. Some blame possibly attaches to those who issue such reports. Officials and official bodies are apt to consider their duty finished when they compile and issue their reports and are too little concerned with their reception or appreciation by the ordinary public. This condition of affairs needs remedy. The public should know what is happening in public health affairs, what is being done, and how it is being done; they should know how the money devoted to the purpose is being spent and whether it is being spent wisely or extravagantly and wantonly; they should have some idea of what results may be expected and what are attainable; and reasons both for failure or success should be forthcoming. Public health work, which is not stimulated and appreciated by informed and intelligent criticism by the public on whose behalf it is being done, will be lifeless, routine, and often badly and expensively

carried out. There is a good need for enlightened Indian public opinion and interest in health matters, individual and collective, and until this is forthcoming, the work even of those who so much wish for progress is unencouraged; enthusiasm wanes and progress is checked. How can we alter things and get people to develop an interest in these important matters? Dr. Batra has ideas on the subject. He has, one might say, a passion for collecting information, and a very definite talent for expressing this information in a clear and interesting manner, together with a critical yet simple exposition and interpretation of its values and meaning. To my mind, this is something which is badly needed in Bengal at the present time, both in municipalities and in rural areas. Dr. Batra presents his facts, reviews and comments in three forms, first as 'health books' of municipalities, secondly as a critical 'Note on the working of a group of municipalities in the Burdwan division', and thirdly as a general 'Report on over a hundred units in the Burdwan division'. Health books have been published by the municipalities of Tamluk, Burdwan and Howrah. In these, the chief facts of the town are presented in graphic and tabular form, with a short note on the history and development of the municipality, interspersed with short but lucid advice on health matters.

The 'Note on 29 municipalities in Burdwan division' is based on a combined tabular statement of all the information which is available about such municipalities. In the note, this information is reviewed critically, comparisons between municipalities are shown, shortcomings are pointed out and remedies suggested. In these municipalities environmental hygiene such as water supply, refuse and excretal disposal and housing is generally poor and it is as an incentive to improve these elementary essentials that Dr. Batra's criticisms and suggestions are mainly levelled. Personally I read the review with great interest and feel that many of the readers in these municipalities must be roused to the necessity for doing something more and something better than is being done at present.

It will be remembered that in 1927 (?) the Government of Bengal adopted a bold policy of establishing a sanitary officer in each thana of the province. This has now been largely carried out and the question naturally arises as to how it is being carried out and what effect it is having on rural public health. Dr. Batra endeavours to answer these queries in his 'General report on 107 health units in the Burdwan division for 1933-34'. In this a comparative statement is given of the work done during the year 1933 by these circles and the information is given under many varying heads. This table is accompanied by a general report by Dr. Batra on his inspections. It would serve no useful purpose to repeat Dr. Batra's remarks. Criticism, praise and blame are given impartially. Particular attention is paid to an appreciation of the sanitary situation in each circle and how 'advance' sanitary programmes with definite aims and objects can be made out for the circles in each district. The circles in Midnapore seem to be doing very good work, and

the value of a keen, energetic and conscientious district health officer becomes very apparent. I note with satisfaction that Dr. Batra recommends the appointment of assistants to district health officers, trained and qualified with the D.P.H. This to my opinion is a very urgent necessity if full use is to be made of the present rural health organization and staff. I read the report with great interest and I hope every District and Union Board member will read it and learn what has been the character of the work done in these areas, its good and bad points, noting particularly the suggestions made for its improvement in the immediate future.

A. D. S.

ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF ASSAM FOR THE YEAR 1934

Cholera.—The largest number of deaths (596) occurred in December and the lowest (33) in October. The highest death rate (0.48) was reported from the Goalpara district followed by Sylhet (0.44). The disease was prevalent in the Sylhet district more or less throughout the year. The district of Goalpara was practically free from cholera until September. In October, however, cholera was first reported from a village in the Bijni thana circle. Infection was brought to this district by a Nepali herdsman and spread by contamination of water supplies and by human agency to both banks of the Brahmaputra. Besides the epidemic unit staff of the district, consisting of three sub-assistant surgeons and six disinfectant carriers, the epidemic unit staff of the Kamrup district and all available medical men of both the public health and medical departments were concentrated in the affected areas. They were employed on mass inoculation of the people in the infected and neighbouring villages, and the disinfection of water supplies. Both the assistant directors of public health visited the infected areas and supervised preventive measures. A total of 44,539 persons was inoculated. A serious flood occurred in the Nowgong district in June and all preventive measures against the outbreak of any epidemic disease were taken. Bacteriophage was distributed freely, water supplies were disinfected and inoculation with cholera vaccine was given to those who asked for it. Floods also occurred during the same month in the Sylhet district and the assistant director of public health, Surma Valley and Hill Division, was detailed to the affected areas.

A total of 871,316 doses of bacteriophage was issued during the year under report of which 60,231 were issued to tea gardens. Bacteriophage is being experimented with in the Nowgong district and in the Habiganj subdivision of the Sylhet district. In these two areas no cholera vaccine whatsoever is administered.

The mortality from cholera in Assam during the last eleven years has been as follows:—

1924	..	..	..	19,182
1925	..	..	..	6,233
1926	..	..	..	10,275
1927	..	..	..	15,392
1928	..	..	..	6,915
1929	..	..	..	7,765
1930	..	..	..	6,332
1931	..	..	..	5,523
1932	..	..	..	4,971
1933	..	..	..	5,508
1934	..	..	..	1,904

The province was fortunate in that it remained free from any epidemic of the disease during the greater part of the year. Sporadic outbreaks, however, made their appearance in the Assam Valley districts from time to time. In November, however, the district of Goalpara was visited by a serious outbreak of cholera in epidemic form. This epidemic involved 194 villages with 1,084 attacks and 599 deaths. All the available resources of the public health and medical departments were concentrated in combating the epidemic.

In the Surma Valley there was no serious epidemic of cholera during the year under review. In December, however, there was an outbreak of cholera in the Habiganj subdivision.

Yaws.—During the year under report a total of 3,089 cases of this disease was brought under treatment with striking results in the province. The disease is very widely prevalent and there is every indication that it is showing a tendency to spread.

Kala-azar.—The number of kala-azar cases treated from 1924 to 1934 are as follows:—

1924	..	..	..	48,770
1925	..	..	..	60,940
1926	..	..	..	49,385
1927	..	..	..	33,415
1928	..	..	..	23,576
1929	..	..	..	23,804
1930	..	..	..	16,430
1931	..	..	..	12,592
1932	..	..	..	11,958
1933	..	..	..	12,650
1934	..	..	..	13,398

The number of deaths from kala-azar was larger in 1934 by 21 than that of the preceding year. The number of patients treated was also larger by 748 over 1933. The increase is shared by the districts of Cachar, Sylhet, Darrang, Nowgong, Sibsagar and Garo Hills. As in the previous year, the attention of civil surgeons concerned has been drawn to this fact and they have been asked to report any possible recrudescence of the disease so that steps may be taken at once to deal with the situation. The method of diagnosis and treatment of kala-azar was the same as in previous years. Special attention is given in all districts to intensive and detailed surveys in order to detect fresh cases. Villages within a certain radius of dispensaries in kala-azar infected districts are surveyed by the medical officers in charge. In the Cachar district the sub-assistant surgeon deputed for the purpose surveyed Katigora, Hailkandi and Katlicherra areas during the year, visiting 12,550 houses and detecting 75 cases of the disease. Arrangements have been made for the treatment of these cases. During the year under review the number of beds in the Moibong kala-azar hospital was reduced from 20 to 10, owing to the fall in the number of patients.

Malarial fever is by far the greatest scourge of the province. It is prevalent throughout the province in greater or lesser degree at all times in epidemic form. During the year, 665,983 cases of malaria were treated in all hospitals and dispensaries in the plains districts. Separate mortality figures from malaria are not available. As already noted there were 101,779 deaths from fever and this is responsible for 65.37 per cent of the total provincial mortality during the year. The largest percentage of deaths under 'fevers' is directly attributed to malarial fevers. During the year under review, quinine sulphate was replaced by quinine-reinforced cinchona febrifuge and was sold at annas 3-9 per treatment. To bring this preparation within easy reach of all, more agents for its sale have been appointed. A lump provision of Rs. 24,500 was made by Government to carry out anti-malarial measures in the province. The Provincial Advisory Malaria Committee held three meetings during the year to consider the relative merits of schemes and to allot funds. Anti-malarial measures were carried out in many areas.

During the year under report 7,965 parcels of quinine treatments were sold against 8,648 in the preceding year, showing a decrease of 683 parcels. The decrease is due mainly to a drop in sales by 562 parcels in the Lushai Hills district. The number of malaria cases treated in dispensaries of this district was less by 8,182 cases. This indicates that malaria was less prevalent in the district during the year under review. Up to June, quinine was sold at below cost price, i.e., at annas 4-6 per treatment. From July quinine-reinforced cinchona febrifuge in tablet form was substituted and was made available for sale. The drug was sold to the

public through the agency of post offices and various other accredited agents at annas 3-9 per treatment. The number of agents for the sale of this drug was largely increased in order to bring the treatment within easy reach of all. As in the previous year, owing to the unusual virulence of malarial fever, quantities of quinine and cinchona were obtained for free distribution to indigent malaria patients in the badly infected areas in the plains districts.

FIFTH ANNUAL REPORT OF THE ASSOCIATION FOR THE PREVENTION OF BLINDNESS, BENGAL, 1934-35

In presenting the fifth annual report of the Association for the Prevention of Blindness, Bengal, the committee wish it to be known that although the activities of the association have much enlarged and have spread to different spheres during the year under review, yet they have not nearly reached their ultimate aim owing to the limited resources at their command.

The enlargement of the committee from 7 to 18 members has enabled the association to extend its propaganda work and increase its activities.

It has not been possible to start the travelling ophthalmic dispensary which is at present one of the principal aims of the association to spread preventive methods into the districts and to bring modern ophthalmic treatment within the grasp of the masses in the outlying villages of Bengal. It is hoped to run these travelling ophthalmic dispensaries on the lines of those at present working in Egypt and which have proved so successful, but they must necessarily be run on a less expensive scale until funds are more plentiful. The cost of running a travelling ophthalmic dispensary will be a minimum of Rs. 7,000 per annum of which Rs. 1,800 alone will be spent on the salary of the medical officer who will be a specialist in eye diseases. It will indeed be a matter of great pride if the first travelling ophthalmic dispensary in India is started in the province of Bengal.

During the year under review, more coloured posters were printed in large numbers and were distributed through the Bengal branch of the Red Cross and to different hospitals and dispensaries in the province. They were also sent to medical men and others interested in the movement for the prevention of blindness in Bengal. Booklets of the association were also distributed to the various schools and colleges in Bengal. It has been proved by experience that demonstrations with posters are simple and effectual ways of instructing and educating the laity in the best methods of prevention of blindness. It is very necessary that they should be colourful and simple. The posters belonging to the association created great interest and received a good deal of praise at the last conference of the All-India Ophthalmological Society held in Madras. Copies of these posters can be obtained free by anyone interested, by applying to the registered office of the association at the Eye Infirmary, Medical College Hospitals, Calcutta.

Magic lantern slides form another important part in propaganda work. The association is now very well equipped with coloured, simple slides, which are very excellent. In addition to the magic lantern slide lecture entitled 'Care of the Eyes' a recent addition in the form of another magic lantern slide lecture entitled 'Prevention of Blindness in Bengal' has been added and comprises 54 slides. They have been made, as in the past, by the Y. M. C. A. Lecture Department, 5, Russel Street, Calcutta, from posters belonging to the association. Copies of these slides can be obtained at a small cost at the above address and copies of the lecture can also be obtained from the office of the Association for the Prevention of Blindness, Bengal, at the Eye Infirmary, Medical College Hospitals, Calcutta. Due to the munificence of the Indian Red Cross Society to its provincial branch, the sum of Rs. 1,650, as mentioned in the last annual report, was presented for lectures and educating teachers in the

schools and colleges of Bengal on methods of prevention of blindness. These lectures are still being given and are a great success. They are delivered by trained young ophthalmologists under the direction and supervision of the honorary secretary of the association. They are essentially practical and consist of simple methods of prevention and magic lantern slide demonstrations. A special syllabus has been prepared and printed for the guidance of these lecturers. They are paid Rs. 10 per lecture, namely, Rs. 20 for two lectures, which constitutes a course for each school. Difficulty is being experienced for the travelling expenses of the lecturers, otherwise lectures and demonstrations could be given in more districts and subdivisions in Bengal. An effort is being made to solve this difficulty in the near future. These courses of lectures are greatly appreciated by the authorities of the schools and colleges judging by the letters of appreciation received from time to time. The lectures are specially meant for teachers but senior students are also allowed to attend and they do so in large numbers. The audience are invited to ask questions after the lectures which are answered by the lecturer.

During the year under review the following four booklets have been brought out by the association:—

- (1) 'Glaucoma'—written in Bengali script.
- (2) 'Glaucoma—a symptom-complex of epidemic dropsy'.
- (3) 'Refraction'.
- (4) 'Blindness in India'.

The following is a list of the booklets previously published by the association, copies of which can be obtained free on application:—

- Common Eye Diseases of Bengal.
- Causes of Blindness in India and their Prevention.
- The Anatomy and Physiology of the Normal Eye.
- Hygiene of Vision.
- Sight Preservation.
- Sight Preservation (in Bengali).
- Glaucoma.
- Syllabus for a Course of Two Lectures on Prevention of Blindness. (For the guidance of the lecturers only.)
- Care of the Eyes.

During the year, epidemic dropsy again broke out in many parts of Bengal. Outbreaks also occurred in parts of Bihar, the United Provinces and Burma. The disease is almost exclusively confined to Bengalis. As pointed out in last year's report, glaucoma is a frequent complication of epidemic dropsy and is one of the most dreadful diseases that can affect the eye and unless the correct treatment is given it leads to partial and often complete blindness. It is a disease that can to a large extent be prevented and information for its prevention and cure has been disseminated on many occasions through the lay papers, and the radio with satisfactory results. Large numbers of patients suffering from epidemic dropsy glaucoma in all its stages present themselves at the various hospitals in Calcutta for treatment.

REPORT OF THE MEDICAL OFFICER OF HEALTH, MUNICIPALITY OF COLOMBO, FOR 1934

The rainfall during the year was exceptionally high and unevenly distributed, the total rainfall being 114.77 inches as against 89.49 inches in the previous year and 90.78 inches the average for the previous 20 years.

There was practically a drought during July, August and September with heavy rain during October and November followed by scanty rain in December. During April and June too the rainfall was well above the twenty-year average, being 17.04 and 18.22 inches as against 8.88 and 8.98 inches respectively. These abnormal weather conditions naturally influenced the morbidity and mortality rates to a certain extent

especially in respect of pneumonia, influenza, and malaria.

The corrected general death rate was 21.3 as against 20.4 in the previous year and 18.6 the lowest recorded rate which was in 1932, the rise being mainly due to an increase in the number of deaths from pneumonia, influenza and malaria.

The corrected maternal mortality rate was 20.7 as against 16.2 in the previous year, which was also the lowest rate so far recorded, the rise being mainly due to an increase in the number of deaths from puerperal septicæmia. The corrected puerperal septicæmia rate was 12.5 per 1,000 births as against 8.7 in the previous year and 10.1 the average for the previous quinquennium. In this connection it is interesting to note that the mortality rate from this cause was 3.3 per 1,000 births in the cases conducted by the municipal midwives and 9.2 in the cases conducted by others.

The conditions under which parturition takes place in the slum dwellings of the poor are conducive to the maintenance of this high mortality rate from puerperal septicæmia. The provision of three small maternity homes which are now under construction wherein labour cases could be conducted under aseptic conditions should go a long way towards reducing the high mortality rate from this cause.

The infant mortality rate too showed an increase, the corrected rate being 193 per 1,000 births as against 173 for the previous year and 184 the average for the previous quinquennium; the rise being mainly due to the steadily increasing number of deaths from premature birth which accounted for no less than 23.7 per cent of the total infant deaths and to a lesser extent to an increase in the number of deaths from pneumonia, influenza, and towards the end of the year malaria.

The stillbirths also showed a rise being 64.6 as against 61.8 per 1,000 live and stillbirths. To what extent the various underlying causes of premature and stillbirths, viz, syphilis, illegitimacy, ankylostomiasis, alcoholism, the toxæmias of pregnancy, fatigue during the later stages of pregnancy, ill-nourishment, and general bad health of the mother, are responsible is not known and needs careful study and investigation. In the writer's opinion venereal disease probably plays an important rôle, and though some of the known brothels in the city have been closed down it should not be imagined that prostitution has also disappeared or been reduced. On the other hand, there is evidence that prostitution, unlike the other trades, is in a flourishing state, and that venereal diseases are on the increase. Not being a notifiable disease its real incidence cannot be known but much could be done to stem the ravages of these serious diseases by Council establishing venereal disease clinics to be run in conjunction with its free dispensaries where free advice and treatment would be available to the poorer citizens among whom the incidence would naturally be greater. I should like to commend this matter to Council's serious attention as being one of capital importance for the welfare of the city.

In regard to the major infectious diseases, smallpox was again introduced from India in September and was responsible for 41 cases in the city. Plague was responsible for 34 cases and cholera 1 case.

Pneumonia continues to head the list as the principal cause of death, there being 1,186 cases with 1,126 deaths. Enteric fever also showed an increase in the number of cases, being 384 as against 302 in 1933, but the deaths were fewer being 172 as against 190 in the previous year. Chickenpox, measles and dysentery showed an improvement over the previous year.

Malarial fever became epidemic over an extensive area of the Island and cases began to occur in the city as from December onwards. On investigation it was found that only a relatively small number of the cases attending at the municipal dispensaries had been infected within the city and that the majority of the cases had been infected elsewhere. It is however an admitted fact that cases of malarial fever do occur in

Colombo in people who have not been in recognized endemic areas. The recognized malaria carrier, *Anopheles culicifacies*, is found breeding in the abandoned quarry pits and in shallow wells, and a reservoir of infection is found in those persons who have been infected elsewhere but who are now resident in Colombo.

Though certain of the mortality rates show a set-back as compared with the previous year, the health of the city on the whole was satisfactory and is slowly but steadily improving *pari passu* with the progress made in general sanitation, housing and drainage.

A good deal has been done by Council in extending the sewerage system of the city and in providing for its own employees sanitary dwellings with the amenities necessary to healthy living.

A great achievement has been the tackling of the Kochechikade slum, which consisted of a heterogeneous collection of dwellings, filthy, undrained, ill-lighted and ill-ventilated and where disease, dope, vice and crime had their general headquarters. Now clean, model dwellings, wide streets and open spaces have transformed a great part into a decent residential area and the standard of health of the occupants has been vastly improved.

Amelioration is required not only in respect of the housing conditions of the people but in matters concerned with drainage and food protection. For instance the manner in which food is adulterated, prepared and sold to the public constitutes a distinct danger and is a disgrace to this city. In matters concerned with the public health sympathy should not override sane judgment. In order to give employment to a few we permit thousands to get infected with disease as evidenced by the figures given in the report under bowel diseases (enteric fever, diarrhoea and enteritis, dysentery). Unless very stringent regulations are passed to control the sale and preparation of foodstuffs we shall have to face the discredit of being convicted of negligence in a matter of prime importance. Unless and until these grave defects in the living conditions of the masses are remedied it is futile to expect our morbidity and mortality rates to come down year after year.

Another matter concerned with administration to which I should like to direct the attention of Council is the necessity for increasing the higher staff of the Public Health Department. With the rapid growth of the department and the extension of its activities the vast amount of ordinary routine work leaves one no time to investigate and study various important public health problems which still await solution. Recent surveys carried out by the Central Medical Department on hookworm disease and leprosy showed that there was quite a considerable amount of infection in the city, and that the complacent manner in which the city was regarded as being free from these infections was not justified. There are other matters that call for investigation and action such as malaria, filariasis, venereal disease, pneumonia, premature and stillbirths, and unless time is available for collecting data and studying them remedial measures cannot scientifically be adopted or applied.

The recent malaria epidemic which threatened the city demonstrated how inadequately we were prepared to meet such a menace. There was no anopheline survey of the city available, and in the absence of such information several thousands of rupees were spent, much of it uselessly, in a somewhat blind and indiscriminate oiling campaign. If this department had the services of an epidemiology officer, whose appointment the writer recommended some years back, we should not have found ourselves in such a helpless position. In matters of public health cheapness is the enemy of economy and is directly opposed to the interests of the people. Staff officers should have the time not only to deal with the general routine work arising from day to day but to initiate and carry out investigations into the various public health problems confronting them.

Correspondence

ANTISEPTIC PROPERTIES OF RAW COD-LIVER OIL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In the January edition of your *Gazette* appeared an article on the healing and aseptic powers of cod-liver oil. I quite agree with it. In the Hardinge Hospital, Datia, C. I., I have been trying this method and from the following facts you will see how wonderful are the aseptic and recuperating powers of cod-liver oil:

1. A boy, aged 11, fell down from a bicycle, and had a small punctured wound. The probe revealed a foreign body; operation was attempted. But the foreign body having lodged deeply and being afraid of injuring the knee joint I left it to nature. The pus was coming freely and pain was so severe that the patient had no sleep for a week. I started cod-liver oil dressings, the pus became gradually less and the pain also disappeared. After a few days when the wound began to heal two twigs half an inch in size came out of the wound and the patient made an uneventful recovery.

2. A kahar boy, aged 19 years, came with stoppage of urine. On examination a big stone was discovered. A suprapubic cystotomy had to be performed. Aseptic dressings were applied. Every part of the wound healed up, except a small hole which was discharging drops of urine. First chlorogen dressings were applied with no result and then acriflavine dressings were applied, still the hole did not heal. Then cod-liver oil dressings were applied. I am glad to say within a week the wound began to heal and the hole closed up totally within 10 days' time.

3. This was a case of tiger bite so severe in nature that the patient was drowsy with fever of 101°F., dryness of the mouth and headache. There were five bites on the top of the shoulder joint, each bite communicating with the other. The wounds were cauterized with carbolic acid and after giving him injections of tetanus serum and polyvalent anti-streptococcic serum the wounds were thoroughly washed with carbolic lotion and hydrogen peroxide, and chlorogen dressings were applied. The whole night, the man was in awful pain and in the morning when dressings were being changed a huge quantity of serosanguineous pus flew out of the channels formed by the upper and lower teeth meeting each other during the bite. I started cod-liver oil dressings immediately and I am glad to say the patient felt the soothing effect of the oil, had a peaceful night and next day the condition of the wound was healthier than before with very little discharge of pus. The patient steadily progressed and was discharged quite cured within 15 days. These cases are very dangerous inasmuch as the tiger's teeth are always badly infected, besides when biting it crushes a large amount of the tissues which by decomposition generally kills the patient by causing septicæmia before the healing sets in. I generally get such cases and this is the first time when I have had such a good result.

I have many instances in which antiseptic dressings with chlorogen and acriflavine have failed and the last successful resort has been cod-liver oil. I am consequently convinced of the fact that treatment by cod-liver oil in suitable cases of surgery are far more beneficial and less costly than such things as chlorogen, eusol, acriflavine, etc. As to why this raw oil should have such quick effect in healing all kinds of wounds I have no definite idea. All that suggests itself to me is that it has got some properties by which no germs of disease can flourish in it and, secondly, there are certain vitalizing or life-giving properties known as vitamins which play an important part in helping to develop the tissues at a rapid rate and thus granulating the wounds quickly.

Thanking you for allowing me a little space in the columns of your esteemed paper.

Yours, etc.,

G. C. BOSE, B.A., L.R.C.P., L.R.C.S. (Edin.),
L.R.F.P. & S. (Glas.), L.M. (Dub.),

State Surgeon and Chief Medical Officer,
Datia State, C. I.

DATIA,
29th March, 1936.

Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL R. KNOWLES, C.I.E., Professor of Protozoology, School of Tropical Medicine, Calcutta, is appointed to act, until further orders, as Director of the same institution, *vice* Brevet-Colonel R. N. Chopra, granted leave.

Lieutenant-Colonel J. A. S. Phillips, Director of Public Health, Bihar, is appointed to officiate as Inspector-General of Civil Hospitals, Bihar, with effect from the 1st April, 1936, *vice* Colonel P. S. Mills, granted leave.

Lieutenant-Colonel Vance, an Agency Surgeon, on return from leave, resumed the charge of his appointment of Residency Surgeon, Kashmir, with effect from the forenoon of the 17th March, 1936.

Lieutenant-Colonel J. M. Shah, Specialist in Venereal Diseases for the Bombay Presidency, Bombay, is appointed to officiate as Superintendent, J. J. Hospital and B. J. Hospital for Children, in addition to his own duties, *vice* Lieutenant-Colonel Vazifdar, proceeding on leave.

Lieutenant-Colonel G. Covell, Director, Pasteur Institute of India, Kasauli, is placed on foreign service under the Indian Research Fund Association to officiate as Director, Malaria Survey of India, with effect from the date on which he assumes charge of his duties.

The services of Major A. D. Loganadan, Officer on Special Duty in the Office of the Public Health Commissioner with the Government of India, are placed temporarily at the disposal of the Chief Commissioner of Delhi, for appointment to officiate as Assistant Director of Public Health, Delhi Province, Health Officer, New Delhi and Notified Area, Civil Lines, with effect from the date he assumes charge.

The services of Captain B. S. Sandhu are placed temporarily at the disposal of the Government of Bombay for employment in the Jail Department, with effect from the 7th March, 1936.

LEAVE

Colonel P. S. Mills, Inspector-General of Civil Hospitals, Bihar, is granted leave for 6 months and 17 days, with effect from the 1st April, 1936, with permission to affix the Puja holidays to the leave.

Brevet-Colonel R. N. Chopra, C.I.E., K.H.P., Professor of Pharmacology, School of Tropical Medicine, Calcutta, and Officiating Director of the same institution, is granted leave, *ex-India*, for 1 month, with effect from the 15th July, 1936, and is permitted to prefix the summer vacation of the school for 1936 to the leave.

Lieutenant-Colonel S. S. Vazifdar, Professor of Medicine, Grant Medical College, and Physician and Superintendent, J. J. Hospital and B. J. Hospital for Children, Bombay, is granted leave on average pay for 1 month and 16 days, with effect from the 27th April, 1936.

Lieutenant-Colonel J. A. Sinton, V.C., O.B.E., Director, Malaria Survey of India, on foreign service under the Research Fund Association, is granted leave for

8 months of which 7 months and 7 days will be on average pay and the rest on half-average pay, with effect from 29th March, 1936, or subsequent date from which he may avail himself of it. His services are replaced at the disposal of the Director-General, Indian Medical Service, with effect from the date on which he proceeds on leave.

Captain C. L. Pasricha, Professor of Pathology and Bacteriology, School of Tropical Medicine, Calcutta, is granted leave for 30 days, with effect from the 15th July, 1936, and is permitted to prefix the school vacation from the 16th April to the 14th July, 1936, on condition that the leave is spent elsewhere than in India, Ceylon or Nepal.

PROMOTIONS

Captains to be Majors

G. Dockery. Dated 22nd February, 1936.

J. Quigley. Dated 1st March, 1936.

RETIREMENT

Colonel Sir C. I. Brierley, Kt., C.I.E. Dated 4th March, 1936.

Notes

INFANT FEEDING

IN infant dietary especially, the preference should surely be for natural foods as against synthetic or artificial products and the mass experience of medical officers attached to infant-welfare centres and the infant departments of our hospitals support the view that milk from pasture-fed cows, especially on the luscious grass of English pastures, or its equivalent in powder, powdered by an effective roller process as exemplified in the improved Cow and Gate method, has sufficient actual potency in vitamin D to give complete protection against rickets without the introduction of an additional supplement.

If it is considered necessary in special conditions to reinforce milk in vitamin D it is difficult to find any reason to support the use of an artificial product like irradiated ergosterol, admittedly less potent and not so safe as the natural vitamin contained in a tasteless and odourless cod-liver oil concentrate.

For such a climate as India, sterility to the disease germs of typhoid and gastro-enteritis (diarrhoea) is an essential, and modern installation for powdering milks, by the roller process, achieve this without measurable loss of natural vitamin potency. In some recent bacteriological examinations of milk powders the writer found the export brand of Cow and Gate gave the extraordinary low average count of 89 colonies per ml. with absence of *B. coli* and all pathogenic flora (Dr. John Campbell, *The Antiseptic*, August 1935).

ERGOMETRINE B. D. H.

THE QUICKLY-ACTING WATER-SOLUBLE ALKALOID OF ERGOT

In March 1935 (*British Medical Journal*, 1935, Vol. I, 520), Dr. Dudley and Dr. Chassar Moir announced the isolation of a new alkaloid possessing the clinical properties previously described by Moir. This newly-discovered alkaloid has been named Ergometrine by Dudley and Moir. As was indicated by the earlier results of Moir, there is a striking difference between the action of ergometrine and the previously-known alkaloid of ergot—ergotamine. The latter alkaloid, administered in doses of 2 to 3 milligrammes, provokes uterine contractions only after an interval of thirty-five minutes or more, and even these delayed contractions are erratic and somewhat feeble in character. Ergometrine, on

the other hand, administered orally in a dose of 0.5 to 1 milligramme causes strong contractions which occur in six and a half to eight minutes after administration. As stated in the publication before mentioned '... the onset is sudden, and accompanied by pronounced uterine spasm, which appears to be caused by a succession of contractions so rapid that the organ as a whole has no time to relax. This stage lasts for about an hour, and is followed by a second stage, during which the uterus shows regular, vigorous, isolated contractions, continuing for an hour or more'.

It is observed from the foregoing that ergometrine will prove of immense value in obstetrics particularly on account of the fact that within six and a half minutes of the oral administration of a relatively small dose of it there is produced with unfailing regularity the same effect as that which hitherto has been obtained with so much uncertainty by the administration of the variable liquid extract of ergot.

Thus ergometrine provides that long-felt desideratum—an ergot preparation which acts rapidly and can be safely administered immediately after parturition.

Ergometrine B. D. H. is now available for the use of obstetricians and of general practitioners for oral administration in the form of tablets each containing 0.5 milligramme of the pure alkaloid.

For administration to patients who may still be under anaesthesia or who may be too ill to retain any medication administered by the mouth, Ergometrine B. D. H. is issued in solution in ampoules for intramuscular injection and for intravenous injection. In administering Ergometrine B. D. H. by injection the intramuscular route is usually employed, the intravenous route being reserved for very urgent cases in which a maximum response is required in a minimum time.

GLAUCOSAN

THE application of glaucosan is due above all to its incomparable pupil-enlarging effect while at the same time reducing the pressure (emollient). It is, therefore, particularly valuable for severe iritis, providing the iris-lens coalescence is not too long established. Although it does not render atropine and scopolamine indispensable (which, previously, frequently had to be given up to symptoms of intoxication), it exceeds them appreciably in effect. The effect obtained, that is, the dilatation of the pupil, is preferably maintained by atropine or scopolamine because the effect of glaucosan will only persist for a few hours. Where a drop (laevo-glaucosan) is insufficient to get a wide enough pupil, the organ is massaged near the limbus corneæ at the particular spot with a fine, wadding-covered probe for about 10 seconds.

Furthermore, secondary glaucoma is an important therapeutic object in glaucosan treatment. Operative intervention will here frequently entail the danger, in view of the atrophic condition of the iris, that the iris forceps might pull away a piece of the lens capsule; the operation may therefore readily lead to opacity of the lens, that is, to grey cataract, a very annoying complication with glaucoma (with its shallow anterior chamber). It is, therefore, of the utmost importance to possess a medium which will frequently permit, by a severing of synechiæ, of dispensing with operation. 'In secondary glaucoma, glaucosan will succeed in rupturing synechiæ, which with other mydriatics remain unaffected' (*Brit. Med. Journ.*, 30th March, 1929, pp. 590-2).

Glaucosan drops should be just as indispensable in iritis glaucomatosa. Here is indicated, on the one hand an enlargement of the pupil, on the other hand a reduction of the eye pressure. This double effect—mollification and mydriasis—is accomplished by no other medicament, only laevo-glaucosan will perform it! Atropine is contra-indicated, as it enhances the pressure (nor does it come up to the powerful dilating force of glaucosan) and miotics are contra-indicated,

because they will increase through inflammation iris-lens agglutination. The verdict is therefore right: 'Glaucosan has up to the present remained unexcelled in its effect upon the iris, where synechia require to be ruptured'. This property will secure a firm position for glaucosan drops in ophthalmology, because it helps to obviate the great danger which extensive or even annular iris-lens synechia mean to the eye for the duration of life (Dr. Carl Hamburger in the *British Journal of Ophthalmology*, August 1935).

ZONDEK-ASCHEIM TEST

THE above laboratory test for the diagnosis of pregnancy in the early weeks is done in the Government Hospital for Women and Children, Egmore, Madras. All medical practitioners who wish to have this test carried out for any of their cases may have it done at this hospital. A nominal fee of Rs. 5 will be charged per case. It is now recognized that this is the most reliable laboratory test for the diagnosis of pregnancy in the early weeks.

EXHIBITION MEDAL

WE are informed that Messrs. Down Brothers Limited were awarded a medal for their exhibit at the 10th International Congress of Surgery held in Cairo in December last.

THE GLAXO LABORATORIES

(Reprinted from the *Lancet*, 15th February, 1936)

THE transfer, from cramped and adapted town premises to a spacious semi-rural site, of a manufacturing concern based on scientific control is a vast undertaking. The Glaxo Company is to be congratulated on the successful way in which they have done this. A site of 15 acres at Greenford—that classic spot where Perkin discovered the first aniline dye—has given opportunity for considered and ordered design, an opportunity which has not been lost. A long well-lighted very modern building with only one floor above ground level is arranged so that raw materials brought in at one bay, adapted for easy unloading of lorries, pass through the various processes in their way across the factory part of the building to a dispatch bay, without confusion or unnecessary handling. In some cases raw material is brought to the upper floor so that it may be ground, sieved, mixed with other products, or otherwise treated; so the final preparation then gravitates to the lower level where it is divided into appropriate measured or weighed units and put in suitable containers for sale and use. All this necessary preparation is done with the minimum of effort and with proper regard to cleanliness, but without the eye-wash of redundant precautions designed to make an impression on visitors.

The substances prepared at Greenford include vitamins A, B₁, B₂, C, and D, parathyroid extract, the oestrogenic hormone, ergot alkaloids, pituitary extract, and antiviruses and similar bodies; many of them are sent out in admixture with suitable food products or mineral constituents which may be deficient in the human body and form useful adjuncts to the organic preparations. Milk and Malt products and cod-liver oil of guaranteed potency are also handled at Greenford. Most of the products mentioned can only be offered with confidence to medical men and their patients if their activity and composition can be guaranteed as suitable and reasonably constant in batches made or sold at different times. The greater part of the upper floor of the Greenford laboratories is therefore devoted to control and research.

The chemical laboratory consists of one large room where research and analytical control goes on side by side. This arrangement which, although not usual, is followed in some other large laboratories, such as those at County Hall, has the advantage of enabling the

scientific staff to survey the whole of the work and ensures the pooling of knowledge, experience and initiative, besides easing the dislocation caused by sickness or holidays. Chemical control is supplemented by physical examination where this is of service, as, for example, in the spectrometric assay of vitamin A. Chemical or physical examination suffices for some purposes and in others enable batches of material to be packed ready for issue, but where the question of activity is important, as in the case of vitamins, actual issue is delayed until experiments on animals have shown that the preparation is up to standard. For this purpose a large animal department is kept up, in which thousands of white rats of the well known Wistar strain are bred and stored, both for sale to research workers and for experiments in the laboratory itself. Besides the laboratories mentioned others are devoted to bacteriology and the preparation of vaccines.

The occupation of the new laboratories was carried out very carefully; an illustrated pamphlet was distributed among the workers before the move was effected, and everyone could see from it where he would be working and how to get there, besides finding his way to any part of the building which might concern him. When a visit was paid to Greenford, a few weeks after the move, everyone seemed as 'native and to the manner born'; the obvious newness of the building and some plant erection which was going on were the only signs that the place had not been running smoothly for years.

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Original Articles

ATEBRIN BY INJECTION VS. QUININE IN A TEA-GARDEN PRACTICE

By HUGH FLACK, M.B., B.Ch. (Belf.)

Chief Medical Officer, Doom Dooma and Associated
Tea Companies

D. C. MAJUMDER, L.M.P. (Assam)

Assistant Medical Officer, Daimukhia Tea Estate
and

K. GOLDSMITH, L.M.P. (Assam)

Late Anti-Malarial Supervisor, Doom Dooma Tea
Company, Limited

Introduction.—The treatment of malaria with atebtrin by injection was first brought to our notice in April 1935. We were interested and determined to try its efficacy.

We set out:—

(1) To determine the efficacy of atebtrin by injection in

(a) controlling the clinical manifestations, and

(b) effecting a cure.

(2) To compare it with quinine as an anti-malarial drug.

(3) To find out if it is a practicable line of treatment in a tea-garden practice.

The experiment was tried on a tea garden with a population of 3,000, with a spleen rate of 80 per cent in children aged 2 to 10 years and a malaria morbidity rate of 11 per cent. It was directed by the senior writer (H. F.). The patients were actually treated by the garden doctor (D. C. M.) and the slides examined by D. C. M. and K. G. No selection of cases was made. Groups of three were alternately treated with atebtrin injections and quinine. Slides were examined before treatment commenced, then daily for 8 days and on the 11th and 15th days. The slides—thick and thin—were stained by Leishman's method and each was examined for 15 minutes if necessary. All cases were kept in

TABLE I
Showing dosage of atebtrin by injection

Age	Daily dosage	Number of injections
Up to 3 years ..	0.1 grm. = 1½ grs.	2
3 to 8 years ..	0.2 grm. = 3 grs.	2
Over 8 years ..	0.3 grm. = 4½ grs.	2

TABLE II
Showing dosage of quinine

Age	Daily dosage	Duration
Under 1 year ..	4 grs.	10 days
1 to 2 years ..	6 "	"
2 to 5 " ..	10 "	"
5 to 10 " ..	12 "	"
10 to 12 " ..	15 "	"
Over 12 " ..	20 "	"

was the site selected for injection and the atebtrin was dissolved according to the makers' directions.

A complete record was kept of each patient. The hæmoglobin was taken on admission and on the 15th day by Tallqvist scale. The urine was tested on admission for specific gravity, reaction, albumin and sugar, and again on the 15th day. The splenic enlargement was also measured roughly, at the same times. Those showing sexual forms of the parasite were treated by plasmochin for four days commencing on the 16th day according to dosage shown in table III.

TABLE III
Showing dosage and course of plasmochin

Age	Daily dosage	Duration of course
Under 1 year ..	1/12 gr.	4 days
1 to 4 years ..	1/6 "	"
4 to 8 " ..	1/3 "	"
Over 8 " ..	1/2 "	"

TABLE IV
Showing parasitic incidence

Atebrin by injection			Quinine		
M. T. ..	14	31.11 per cent	M. T. ..	16	35.56 per cent
B. T. ..	21	46.66 "	B. T. ..	22	48.88 "
B. T. and M. T. ..	10	22.23 "	B. T. and M. T. ..	7	15.56 "
TOTAL ..	45	....	TOTAL ..	45	....

hospital for at least two weeks. The experiment started late in July 1935 and ended early in January 1936.

The dosage of atebtrin and quinine adhered to is shown in tables I and II. The buttock

Clinical observations

(1) In the case of atebtrin the temperature reached and remained normal in 1.3 days after the first injection and in the case of quinine in 1.7 days. Three cases in the atebtrin series had

a rise of temperature on the 5th and 6th, 11th, 11th and 13th days respectively, but the peripheral blood in all three was parasite-free, even after a provocative injection of adrenalin. No anti-malarial treatment was given and all three returned to normal and remained there.

(2) The parasites disappeared from the peripheral blood in 1.6 days in the case of atebirin and 1.9 days in the case of quinine. These are

as long as the patients are not exposed to bright sunlight.

Relapses.—In a highly malarious area such as this it is impossible to separate relapses from reinfections. As, however, groups of three were treated alternately by atebirin and quinine, the conditions for both are the same.

Table V shows the relapse-reinfections up to the end of March 1936.

TABLE V
Relapse-reinfections

ATEBRIN BY INJECTION				QUININE			
On admission		On readmission		On admission		On readmission	
M. T.	14	M. T.	0	M. T.	16	M. T.	0
B. T.	21	B. T.	3*	B. T.	22	B. T.	2
B. T. and M. T.	10	B. T. and M. T.	2	B. T. and M. T.	7	B. T. and M. T.	0

* One M. T. case on readmission was B. T., therefore a fresh infection.

the average figures for all cases combined. Subtertian parasites disappeared after 1.2 and 1.5 days respectively and benign tertian parasites after 1.9 and 2.0 days respectively. In mixed infections subtertian disappeared first in all cases except in one treated by atebirin. In the quinine series, however, both the subtertian and benign disappeared at the same time. In the atebirin series 12 cases showed crescents and in 11 they persisted, and of the benign tertian cases one showed gametocytes which disappeared after treatment. In the quinine group, 7 subtertian cases had crescents in 6 of which they persisted after treatment, and 6 of the benign tertian cases showed gametocytes in one of which they persisted.

(3) The spleen was roughly measured on the day of admission and on the 15th day. All had enlarged spleens and although a reduction was noticed in most cases, it was more pronounced in the quinine series.

(4) There was a slight improvement in the hæmoglobin of most patients but it was so small that it could fall within an observer's error or be accounted for by hospital feeding. We had noticed that the patients looked paler after the two injections of atebirin but it did not occur to us then to take their hæmoglobin.

Complications.—Two patients were restless and had profuse perspiration after the first injection and one showed signs of delusion after the second injection. The former had no treatment but the latter was given veronal and was not quite normal for 22 hours. The patients did not complain of the injection and the senior of us, who has had the treatment himself, can confirm this. No precaution was taken to prepare the atebirin solution in dim light. Most of the cases were injected between 2 p.m. and 6 p.m. but we are of opinion this is not important

It will be seen that relapses in the atebirin series were double those in the quinine series.

Summary

(1) A comparison is made between atebirin by injection and quinine as anti-malarial drugs. The numbers are too small to draw any definite conclusions but it appears:—

(a) Atebrin by injection acts better than quinine in controlling the clinical symptoms and freeing the peripheral blood of parasites.

(b) It is more effective than quinine in subtertian malaria but has hardly any advantage in benign tertian.

(c) It has no influence on the sexual forms of the parasite.

(d) It has less effect on splenic enlargement than quinine.

(e) Complications are negligible.

(2) The doses recommended by the makers are, in our opinion, adequate for the type of coolies we deal with and we do not agree with Carman and Cormack (1936) in this respect.

(3) As a practical proposition in a tea estate with considerable malaria it is at present too expensive a measure, but for European and Indian staffs we consider it the most reliable drug for subtertian malaria.

Acknowledgments

We have to acknowledge the interest taken and support given by Messrs. Casebourne, Batterbury and Hunter, Superintendent, Manager and Acting Manager respectively, and to the subordinate hospital staff. The atebirin for injection was kindly supplied by Messrs. The Haverro Trading Company, Limited, Calcutta, to whose representative, Dr. Brocke,

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OBSERVATIONS ON THE RELATIVE VALUE OF ATEBRIN AND QUININE AS THERAPEUTIC AGENTS IN MALARIA*

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In the paper by Williams and Bhattacharyya (1935) we recorded our observations on the therapeutic value of atebtrin in the treatment of malaria in this district. But those observations lost some of their value as there were no comparable controls treated with quinine. So a second experiment was taken up, beginning in July 1934 and ending in January 1935, with the following objects:—

(1) To determine the relative efficacy of atebtrin and quinine in controlling clinical symptoms of malaria.

(2) To ascertain their relative value in freeing the peripheral blood of malaria parasites.

(3) To note their relative efficacy in reducing splenic enlargements due to malaria.

Alternate malaria cases were treated in hospital with atebtrin and quinine respectively. Blood slides (thick and thin films combined, stained by Giemsa's method) of each patient were examined daily for malaria parasites until they became negative, 5 minutes being spent in the examination of each slide. Altogether 42 cases were thus treated—21 with atebtrin and 21 with quinine, of whom 3 were adults and 39 children. The following dosages and courses of treatment were adopted:—

TABLE I

Showing the dosage and course of treatment with atebtrin

Age	Daily doses	Duration of course
Adults ..	3 tablets (= 0.3 g. or $4\frac{1}{2}$ grains).	5 days
Children of 4 to 8 years.	2 tablets (= 0.2 g. or 3 grains).	"
Children of 1 to 4 years.	1 tablet (= 0.1 g. or $1\frac{1}{2}$ grains).	"
Children under 1 year.	$\frac{1}{2}$ tablet (= 0.05 g. or $\frac{1}{2}$ grain).	"

N.B.—Children over 8 years were given the same doses as adults.

* Read at a meeting of the Assam Frontier and Budla Beta Medical Society held on 23rd February, 1935.

(Continued from previous page)

and their local agent, Mr. Sen Gupta, we are highly indebted.

REFERENCE

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TABLE II

Showing the dosage and course of treatment with quinine sulphate

Age	Daily doses	Duration of course
Adults ..	20 grains	5 days
Children of 10 to 12 years ..	15 "	"
Children of 5 to 10 years ..	12 "	"
Children of 2 to 5 years ..	9 "	"
Children of 6 months to 2 years	6 "	"
Children under 6 months ..	4 "	"

N.B.—Children over 12 years were given the same doses as adults.

TABLE III

Showing the parasitic incidence of the cases treated by atebtrin and quinine

Parasites	NUMBER OF CASES TREATED		
	Atebrin	Quinine	Total
B. T. ..	12	8	20
M. T. ..	6	11	17
Mixed B. T. and M. T.	3	2	5
TOTALS ..	21	21	42

Observations

(1) Temperature finally came down to normal after 2.2 days of atebtrin administration and after 1.9 days of quinine administration, the amount of atebtrin and quinine respectively being taken according to age. The courses of atebtrin and quinine, as shown in tables I and II respectively, were sufficient in all cases except one. In this case, a child aged nine months, quinine had to be administered for 6 days until the temperature finally came down to normal. It must be mentioned that this child did not fail to swallow the quinine mixture properly and regularly.

(2) The parasites disappeared from the peripheral blood after 2.1 days of atebtrin administration and after 2.5 days of quinine administration. This was the average for all species of parasites taken together. But taken separately, it was found that in benign tertian infections the parasites disappeared after 2.2 days of atebtrin and 2.1 days of quinine. In subtertian infections, however, the parasites were found to disappear after 2.3 days of atebtrin and 2.7 days of quinine. In one of the subtertian cases treated by atebtrin, the parasites in the blood film appeared much more numerous on the second day of treatment and the patient seemed somewhat prostrated. This provocative effect of atebtrin on subtertian parasites during the first

48 hours of treatment was also noted by Johnson (1934).

Of the 5 mixed cases (benign tertian and malignant tertian), 3 were treated with atebirin and 2 with quinine. In two of the atebirin treated cases and in one of the quinine treated cases, subtertian rings were the last to disappear. Crescents were encountered only in two subtertian cases, one of which was treated with atebirin and the other with quinine. But in both of them crescents persisted after the full courses of treatment. Gametocytes were encountered only in 7 benign tertian cases, 4 of which were treated with atebirin and 3 with quinine. In the former 4 cases, no gametocyte could be found after the full course of treatment with atebirin, but in the latter 3 cases, *gametocytes persisted in one after the full course of treatment with quinine.*

(3) Of the 21 cases treated with atebirin 16, and of the 21 cases treated with quinine 15 had enlarged spleens. The size of the spleens diminished at the same rate whether treated by atebirin or by quinine. This is in conformity with the observations of MacMahon (1934) in Trinidad. As the enlargement of the spleen in my series of cases was only of first and second degree, this observation of mine has not much value. The real comparative efficacy of these drugs in this respect could be properly judged, only if the chronically enlarged spleens with third or fourth degree enlargement were treated with them for longer and definite periods.

Remarks

The number of cases in this experiment was small. Experiments like this are more valuable when a very large series of cases is treated. But unfortunately, owing to the lack of time available, a bigger experiment could not be undertaken. Observations on this small series of cases are described only with the hope that this experiment may serve as a precursor to bigger ones on similar lines. These might possibly be undertaken in future by the medical profession in Assam tea gardens, which, I hope, will give information of greater scientific value.

Conclusions

1. In controlling clinical symptoms of malaria, quinine acts rather more quickly than atebirin.
2. In freeing the peripheral blood of malaria parasites, there is a more rapid response with atebirin than with quinine.
3. As a parasiticide, atebirin is superior to quinine in subtertian cases but in benign tertian infection both of them are of equal value.
4. As a crescenticide both the drugs are inefficient, but atebirin acts as a better gametocyticide than quinine in benign tertian infection.
5. In first and second degree enlargements of the spleen due to malaria, the reduction in

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THE TREATMENT OF RHINOSPORIDIOSIS IN MAN BASED ON THE STUDY OF SIXTY CASES

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Introduction

INFECTION of man by *Rhinosporidium seeberi* (Wernicke, 1903) is uncommon when the world as a whole is surveyed, but the fact that the authors saw over sixty cases in the districts of Raipur and Drug, Chhattisgarh division, Central Provinces, India, during the eighteen months in which they were on the lookout for this condition shows that in some places it may be of local importance. Excluding the four conjunctival cases recorded here and including cases seen casually and diagnosed clinically, but which refused to allow themselves to be investigated, and are thus not reported, the total of nasal cases seen remains over sixty. During this time the authors saw only three patients suffering from nasal polypi which were not of rhinosporidial origin. It is therefore considered of importance to place on record the conclusions reached as to the best mode of treatment for, as pointed out by Knowles (1928), the condition is probably much more common in India than is generally supposed and it is often missed.

Textbooks of tropical medicine and surgery, when they mention the condition at all, dismiss the treatment in a few lines and recommend the removal of the polypi from the nose by means of a snare. As has been pointed out by Wright (1922a) this practice can only be condemned, and in the authors' opinion it is positively dangerous, as it may lead to aggravation of the condition by failure to remove all of the infected tissue and cause multiplication of the polypi by implanting the spores in fresh abrasions made

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size takes place at the same rate under both modes of treatment.

Acknowledgments

My sincere thanks are due to my ex-superior, Dr. D. P. Williams, during whose time the major part of the experiment was conducted, for his guidance and encouragement, and also to my present chief, Dr. W. F. Whaley, for his valuable suggestions in preparing this note and permission to publish it.

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at the time of operation. The very serious nature of the infection in cases 6, 31 and 47 of this series, of case 1 of Norrie's series (1929), of Logan Turner's case (Ashworth and Turner, 1923) and of Chierian's case (1929) appear to support this view. It must however be admitted that in cases 16 and 46 of this series the infection had assumed somewhat serious proportions without any previous history of operative interference.

Historical account

Seeber (1900 and 1912) in the appendix to his thesis states that in 1892 Malbran of Buenos Aires studied sections of a growth labelled 'Nasal polypus' and that this growth was caused by rhinosporidium but no publication was made of this case.

On 12th May, 1894, at the Medical College Hospital, Calcutta, O'Kinealy saw a male Bihari Mohammedan, age 22, suffering from a growth in his left nostril. This growth was removed by O'Kinealy and studied by Vaughan, who made the pathological report. The case and the report were not however published until 1903, when O'Kinealy (1903) and Vaughan were still unable to decide whether the parasite should be classified with the *Coccidia*.

In 1896 in Buenos Aires a growth was removed from the left nostril of an Italian male, age 19, who for 18 years had been a resident of the Argentine. Portions of this growth and of a recurrence were studied by Seeber (1900 and 1912), who made his observations known in the thesis he submitted for the degree of Doctor of Medicine. He considered the parasite to be related to the *Coccidia*. Belou (1903) was the first to publish a name for the organism, though Wernicke had apparently suggested the name in 1900.

In March 1897 Ellet commenced operating on the right nostril of a young farmer, who lived near Memphis, Tennessee, U. S. A., and who had never been away from the locality. As the growth kept on recurring he finally sent a specimen, removed in 1902, to Krauss, who later identified it, but nothing was published about this case until Wright (1907).

Minchin and Fantham (1905) published the results of their observations on material from O'Kinealy's case and, being unaware of Seeber's thesis and Belou's book, named the parasite *Rhinosporidium kinealyi*.

In 1906 Theiler removed a growth from the nose of a horse in South Africa and had it despatched to Zschokke (1913), when he gave the parasite the name of *Rhinosporidium equi*.

In 1907 Beattie recorded the occurrence of rhinosporidium in an aural polypus which had been sent to him from India.

Ingram (1910) published an account of a growth on the penis of a Mohammedan from Malabar, and of two conjunctival growths.

Minchin (1912) summarized the knowledge of the structure and life history of rhinosporidium and placed it in the order *Haplosporidia*,

sub-order *Polysporulæ*, and Castellani and Chalmers (1919) found rhinosporidium in a nasal polypus in Ceylon.

Tirumurti (1914) published a summary of the Indian cases and Kirkpatrick (1916) from Madras recorded infection of the lacrimal sac.

The first European case in Lombardy was described by Denti (1925) and Orlandi (in Virchow, 1926) but the reports were not published until 1925 and 1926.

On 6th November, 1922, Ashworth (1923) read his classical monograph, in which he traced the history of rhinosporidium, gave an account of its structure and life history, geographical distribution, inoculation and cultural experiments and described the histology of the polypus. He came to the conclusion that it was not a sporozoon but belonged to the *Phycomycetes*, sub-order *Chytridinea*, and provisionally placed it near the *Olpidiaceae*. He also established its proper name, when occurring in man, as *Rhinosporidium seeberi* (Wernicke, 1903) and gave an amended systematic diagnosis. Finally he added a note on the work of Frey and Hartmann in connection with *Rhinosporidium equi* (Hartmann, 1922).

Forsyth (1924 and 1933) placed on record the first case of skin infection and Tirumurti (1924) reported the first female case, whose history however went back to 1904.

Parodi (1926) drew attention to the occurrence of rhinosporidium in Paraguay.

Cordero and Vogelsang (1928) found the infection in a horse in Uruguay and Chierian and Vasudevan (1929) found a female in India with a growth on the fauces and a polypus in the pharynx.

Ayyar (1925 and 1928) recorded rhinosporidial tumours in the nostrils of cattle in India and in 1932 extended his observations to equines.

Orosa (1929) and Manalang (1929) reported human cases from the Philippine Islands.

Mackenzie (1933) reported the first case in an Englishman, who probably contracted the infection at Kirkee, near Poona, India, where Noronha (1933 a, b and c) has had special opportunities of making studies of this disease, which is not uncommon locally.

O'Flynn and Rudd (1934) in England operated upon a Chinese sailor from Canton but it is not clear where he acquired his infection.

The authors in this series record a case in which a rhinosporidial growth was removed from the larynx (case 47); the specimen was sent to Noronha at Poona.

Although India would appear to be the country where the infection in man is most common, judging from the published records of cases and from the fact that Noronha has told the authors that he has examined over forty specimens from unpublished cases, other cases have been reported from the U. S. A., the Argentine and Ceylon. It is rather surprising that no cases have been recorded from Africa

outside the Union, from Siam, from Indo-China, China itself or the East India Islands. The case recorded from Malaya by Fraser (1915) was probably contracted in India. Zschokke (1913) mentions that he thinks he recollects seeing the parasite in a section made from a conjunctival growth, which had been removed from a Japanese, and which was demonstrated in Zurich in 1908.

Name and classification of the parasite

The first description of the parasite now known as *Rhinosporidium* was published by Seeber (1900) but he failed to name it. Belou (1903) gave a short notice on the parasite under the name *Coccidium seeberi*.

Minchin and Fantham (1905) unaware of the above-mentioned works called the organism *Rhinosporidium kinealyi*. Ashworth (1923) has given his reasons for considering the parasites from the Argentine, from India and from the U. S. A. conspecific and so in his words 'As *Rhinosporidium kinealyi* (Minchin and Fantham, 1905) is identical with *Coccidium seeberi* (Wernicke, 1903) and the latter has priority the specific name *kinealyi* becomes a synonym. The organism is not a *Coccidium*; the genus *Rhinosporidium* was created for it by Minchin and Fantham, and this name, of course, stands. The correct designation of the parasite is *Rhinosporidium seeberi* (Wernicke, 1903)'.

Zschokke (in Hartmann, 1922) has named the very similar organism which causes growths in the nostrils of equines, *Rhinosporidium equi*. Ayyar (1928) has described the growths produced in the nostrils of cattle in India by a similar or identical parasite. Whether this is the same species or another species, which should be called *Rhinosporidium ayyari*, is still undecided for the authors are unaware of any authoritative publication on the subject. Ashworth (1923) has summarized the previous views held by others on the systemic position of *Rhinosporidium* and has given his reasons for indicating 'that the nearest relatives of *Rhinosporidium* are not the *Sporozoa* but the lower fungi (*Phycomycetes*) such as the *Chytridineae*' and places the genus provisionally near the *Olpidiaceae*. Ramsbottom (1931) has accepted Ashworth's suggestion.

Natural infection in animals

Growths caused by *rhinosporidium* have been found in the noses of horses in South Africa by Theiler, in Uruguay by Cordero and Vogelsang (1928) and in India by Ayyar (1932). In the noses of mules in South Africa by Quinlan and de Kock (1927), and in the noses of cattle in India by Ayyar, the only female found infected was a cow. The director of veterinary services, Central Provinces, very kindly issued instructions for his staff to be on the lookout for growths of this nature in the Central Provinces and the authors made many enquiries in villages in Drug district, but no case could be discovered.

Sections of tumours from cattle look very similar to those from man but in equines the growths give the impression of being more compact and the papillary processes appear to be less numerous and the crypts less deep.

Economic and social condition of human hosts with a short review of the Chhattisgarh division of the Central Provinces

Almost all of the reported cases, Noronha's unreported cases and the cases in the authors' series occurred in persons who were not 'well to

do' and whose standard of living, in the Indian cases, was low. Agriculturists predominate even outside India though in Poona the condition is common among the sand workers who have to dive into the river to collect the sand (Noronha, 1933 a, b and c). Noronha has explained the conditions under which the infected sand workers operate so that a description of the area and people of the districts of Raipur and Drug where, judging by the authors' experience, the infection is also common, may not be out of place. No actual survey of the country, to find out the total proportion of the population infected, has been done but many villages have been visited in following up old cases, in the routine inspection of vaccination results and during the annual outbreaks of cholera.

The area from which the authors' cases were drawn is situated almost in the centre of the Chhattisgarh plain division of the Central Provinces, which comprises the open country forming the upper basin of the Mahanadi. The country as a whole is flat or only slightly undulating and only the larger rivers contain water all the year round; it is thickly populated by rice growing and eating inhabitants who are now predominantly Hindus.

Chhattisgarh was originally the home of primitive tribes of the Munda and Dravidian families and was colonized by settlers who came from the north. The Haihaya Rajput dynasty for centuries ruled over it from their principal seat at Ratanpur and isolated as it was by the surrounding hills, forests and wild rugged country, it was for long almost exempt from immigration and change of inhabitants so that the tract developed an individuality of its own, and the Chhattisgarhi has only recently begun to respond to the influences of the higher civilization on his western borders.

The average rainfall of the Chhattisgarh plain is 49 inches, and is favourable for the growth of rice, which flourishes on the red or yellow soils which cover the greater part of the plains. The heavier black soil which lies in stretches along the Mahanadi and Sheonath rivers and elsewhere in the hollows of the undulating country is an excellent wheat-growing soil, but rice now occupies over 50 per cent of the gross cultivated area. During the decade 1921 to 1930 the highest maximum temperature of 116.6°F. was recorded at Raipur on 26th May, 1928, and the lowest minimum of 43.4°F. on 2nd February, 1929, but usually the end of December and beginning of January is the coolest time of the year. In Raipur and Drug districts at the last census there were over 105 females for every 100 males. The female death rate is lower than the male. This may be partly accounted for by emigration for only the younger and healthier males are acceptable elsewhere, but on the whole one cannot help being struck by the more cheerful bearing and finer physique of the peasant women of Chhattisgarh.

The standard of intelligence, sanitation and nutrition is low. Most of the people prefer to drink water from tanks which are very numerous and in which washing of human bodies, animals and clothing is also permitted. The town of Raipur is supplied with crude unfiltered river water. Cholera flourishes and malaria is rife. Venereal diseases and leprosy are common but the effects of untreated syphilis do not on the whole appear to be so disastrous as they would be in Europeans. The cattle are very miserable and their yield of milk is extremely low. Animal fats are almost entirely absent from the average diet and the consumption of milk is negligible. About half the population will eat fish which are obtained from the tanks but the actual consumption per head is not known. Meat is only eaten by a few Mohammedans. The months of March, April, May, and beginning of June are hot and dry. The monsoon is fairly heavy and lasts from the middle of June to the end of September. There is no cold weather and except during the monsoon the dust is very trying.

Types of rhinosporidial tumours

The tumours fall into three groups:—

A. Tumours with a distinct pedicle, the pedicles of which appear to be covered by healthy unroughened mucous membrane or skin. These pedicles may be narrow but are more usually broad. In the nose such tumours usually grow from the septum or from the anterior part of the nasal floor, and tend to remain compact like a strawberry or raspberry on its stalk. They also occur on the conjunctiva, on the skin and in the pharynx, where the pedicle will often be found to be attached to the back of the nose. Gravity or some other tractive force seems to be instrumental in the production of this type of growth.

B. Sessile tumours. These appear to be the earliest forms seen and are usually small and compact. It seems that the growth of the tumours is much more rapid outwards towards the free surface than in the lateral direction along the surface of the mucous membrane or skin so that they tend to lose their purely sessile form and acquire a broad short pedicle with increase in size.

C. Tumours which are partially pedunculated and partially sessile. These were the most common variety seen in the nose in the authors' series, where it appears that the presence of more or less rigid surrounding parts prevent the growths from expanding equally and sufficiently outwards in all directions. They do not seem to occur on the conjunctiva or skin. These tumours show great variations in size, shape and consistence. Some are small masses of tightly packed tendrils, others consist of two or more lobes taking origin from a very broad base, while others again consist of multilobular mixed masses of tightly packed villi and fimbriae and bags of myxomatous or mucoid material. These

bags are covered by glistening mucous membrane except at one or more places where the mucous membrane is seen to be roughened and of a bright red colour. Such tumours will be found to have apparently uninfected pedicles at their anterior ends and possibly on the superior aspect but below and behind the infected mucosa runs off into the nasal wall.

Possible modes of infection

The mode of infection is unknown. Wright has mentioned that the position of the growth suggests dust or water transmission. The authors were first of the opinion that the infection might be obtained from some plant such as rice, when it is being husked (Allen, 1935) and Orlandi (1926) appears to be of the same opinion about the case which he reported. The authors were however assured by the mycologist to the Government of the Central Provinces that no such parasite of rice is known. The fact that so many cases have been found among the sand workers of Poona is more in favour of the possibility of water transmission. Noronha has not however been successful in his efforts to demonstrate the organism in the water of the river in which these infected sand workers operate. O'Kinealy drew attention to a somewhat similar organism in the swim bladder of the Tench. Laveran and Pettit (1910) have noted the resemblance of *Ichthyosporidium* (which causes an epizootic in trout) to *Rhinosporidium*, and Plehn and Mulsow (1911), having shown that *Ichthyosporidium* also causes *Taumel-Krankheit* in salmon, consider it a *Phycomycete* and probably allied to the *Chytridinae*. The villages, from which most of the cases in the authors' series were obtained, are plentifully supplied with tanks in which the people bathe and from which most of them obtain their drinking water. These tanks contain fish and weeds. It is thus a possibility, in view of the close relationship that appears to exist between *Ichthyosporidium* and *Rhinosporidium*, that the latter may also be a parasite or saprophyte of fish and that man, equines and cattle obtain the infection through water in which fish, harbouring the parasite, live.

In view of the fact that attempts at removal may be followed by multiple recurrences it is difficult to avoid the conclusion that trauma is a predisposing factor. This conclusion is strengthened by the case reported by Orlandi, where the patient definitely traced the site of the growth to the position in which she received an injury, and the case reported by Mackenzie (1933), where an English soldier stationed near Poona, which is a recognized centre of rhinosporidiosis, gave a history of receiving a blow on the nose which caused blood to flow. This soldier indulged in bathing near Poona and later developed a rhinosporidial growth in the nose. Norrie is also of this opinion.

The skin involvement in cases 6 and 31 of the authors' series may be explained, to some

extent, by the observation that infected individuals finger their noses and then scratch themselves elsewhere. Some additional factor must however also play a part for this skin involvement seems to occur only in cases of long-standing infection, but not in every one. Forsyth's case (1924 and 1933) was also of this type. Children, whom one would expect, would scratch to a greater extent than adults, have not up to the present been found with involvement of the skin.

An interesting feature in the authors' series is the occurrence of nasal growths in four relatives in the village of Bhoregaon and in two relatives in the village Phorphori. As none of these relatives inhabited the same house as another and as other cases were found in their villages the fact has probably no significance. Two cases have never been found in one house.

Site of infection

The nose appears to be the most common site and then the conjunctiva though any mucous surface may be infected, and cases situated in the ear, in the lacrimal sac, on the uvula and penis have been reported. In the nose the tumours usually originate in the anterior part but the infection can spread backwards, and tumours growing from the back of the nostrils tend to enlarge and hang down into the pharynx while in two cases of the authors' series definite infection of the pharyngeal wall had taken place. The authors also report a case of laryngeal involvement (case 47). There appears to be no reason why infection of the lungs, œsophagus, stomach, vulva or anus should not occur. Apart from cases 6 and 31 the only previously published case of infection having involved the skin away from the mucocutaneous junctions has been traced (Forsyth). All of these cases were primarily infected in the nose and it will be of great interest if a case of skin infection only is brought to light. The foot from case 6 is now in the School of Tropical Medicine, Calcutta, and the scrotal tumour from the same case is in the Robertson Medical School, Nagpur.

Summary of the sites of infection in the authors' series :—

A. Mucous membrane, 60 cases.

1. Nose, 56 cases (nose only, 50 cases). Right nostril 24, left nostril 25, both nostrils 6, undecided 1.
 - (a) Septum only, 16 cases.
 - (b) Septum and inside of bridge only, 3 cases.
 - (c) Inferior turbinal only, 9 cases.
 - (d) Middle meatus only, 1 case.
 - (e) Superior meatus only, 1 case.
 - (f) Floor only, 13 cases.
 - (g) Inside of bridge only, 2 cases.
 - (h) Multiple, 9 cases.
 - (i) Septum involved in 6 cases.
 - (ii) Under surface of bridge involved, 1 case.
 - (iii) Middle turbinal involved, 2 cases.
 - (iv) Inferior turbinal involved, 6 cases.
 - (v) Inferior meatus involved, 1 case.
 - (vi) Floor involved, 2 cases.
 - (vii) Floor and septum involved, 1 case.
 - (j) Undecided, 9 cases.

2. Pharynx, 5 cases.
3. Larynx, 1 case.
4. Conjunctiva, 4 cases.
 - (a) Left upper palpebral, 2 cases.
 - (b) Left lower palpebral, 2 cases.
- B. Skin, 3 cases.

Sex and age incidence

A peculiar feature about infections of man and animals by rhinosporidium is the preponderance of male cases. Apart from the authors' series only four female human cases appear to have been recorded and one female animal, a cow. From the authors' series, five of which have previously been reported (Allen, 1935), out of a total of 60 cases recorded 15 were females giving a ratio of females to males of 1:3.

Children and young adults are the most commonly infected and when older people are seen it is found that the history usually goes back many years. The case from Lombardy is an exception, the patient being 56 years of age at the time of infection. In the authors' series of 60 cases the age groups are as follows: Under ten 19, ten to twenty 21, twenty to thirty 16, thirty to forty 0, and over forty 4, the patients' age being estimated at the time of infection. These figures are only approximate because Indians of the peasant and lower class hardly ever know their exact age and have rather vague ideas of the passage of years.

Clinical features of growths caused by rhinosporidium in man

As seen in the nose, which is the commonest part of the body to be involved, the rhinosporidial growth is typified by a papillomatous mass of granulation-like tissue, varying from pink to a purple-red colour, resembling a ripe raspberry or strawberry. If examined closely the surface is seen to be dotted all over with minute white spots which are the sporangia. The size of the growth as seen from the outside varies according to the length of time it has been present and the size of the nostril, being usually smaller and more compact when patients seek medical advice early, and in children. Macroscopically this type does not appear to have an epithelial covering. The villi or papillæ are not always immediately apparent because they are closely held together by mucous secretion. When touched the growth may bleed freely and when pressed to one side small lobules, fronds, fimbriæ or villi may in some cases be noticed on the hidden aspect. This is more usual in growths which have been present for some considerable time though much variation exists in this respect. In long-standing cases a lobulated mass may actually hang out of the nostril over the upper lip (figure 3, case 6). As described above the attachment of the growth is commonly in the anterior part of the nostril. When the point of origin is further back the resulting growth may appear more definitely villous or papillomatous, with or without some mucoid bags.

As seen in the conjunctiva the infection may appear as a small, pale pink, flattish, granular nodule, freely movable with the conjunctiva, in the earliest cases. It has been found on the bulbar as well as on the palpebral conjunctiva. Older growths, as they increase in size, acquire a deeper almost splenic colour (though the edges



Fig. 1.—A sporangium extruding spores at a point corresponding to half past nine o'clock. Unfortunately the section does not pass through the pore. $\times 300$.

may remain thin and yellowish) and may consist of more than one lobule, freely movable and accommodating themselves between the lids.

The growths which hang into the pharynx tend to be more solid and resemble fresh ripe figs or large ripe strawberries in size. They are usually filled with mucoid material. They may however be long, thin and papillomatous (Noronha in an unpublished communication to the authors). Such growths may originate from the posterior part of the nose, the pharyngeal roof, walls or the uvula.

In the larynx the growth may consist of a loose mass of villi and papillae or it may be of the myxomatous type.

The growth in the ear resembles the ordinary aural polypus, and in the lacrimal sac it resembles a mucocele from the outside, is boggy to the touch and cannot be squeezed flat.

On the penis the early growth looks like a venereal wart, later it becomes cauliflower-like.

Involvement of the rectum or vagina will probably be mistaken for condylomata, piles or rectal polypi.

The early skin lesion appears as a tiny papilloma hardly raised above the surrounding healthy surface. It soon develops into a wart with an obvious crenated surface and may gradually acquire a pedicle (figure 3). Even when subjected to considerable trauma it shows but slight tendency to ulcerate. In some instances bags of myxomatous tissue are formed; these are covered by epidermis which is smooth in places and in others is roughened and crenated (figure 4).

Symptoms

In the nose the earliest symptom may be a feeling of itching followed later by the sensation of a foreign body in the nostril. This leads, especially in children, to picking at the nose and may cause bleeding. There is often a profuse thin or thick mucoid discharge but suppuration has not been seen. If the tumour is growing from the front of the nose the patient may notice it before it causes obstruction to his breathing. In the pharynx and in the larynx the growth causes some respiratory embarrassment and may give rise to difficulty in swallowing. In none of the above-mentioned situations does the growth cause pain. In the eye the growth may give rise to no symptoms and small growths may be unnoticed by the patient. Larger growths induce a sensation of a foreign body in the eye, with or without injection of the conjunctiva, lacrimation or photophobia. Concurrent conjunctivitis, when it occurs, is probably due to dust irritating the conjunctiva which has become exposed by the eversion of the lids caused by the size of the growth. Involvement of the lacrimal sac may cause lacrimation, due to mechanical blockage of the passage. The friable portions of the growths usually bleed readily when touched. The early warts on the skin do not cause pain unless they are situated on the soles of the feet. Later when they enlarge they cause distress and even pain by reason of their weight.

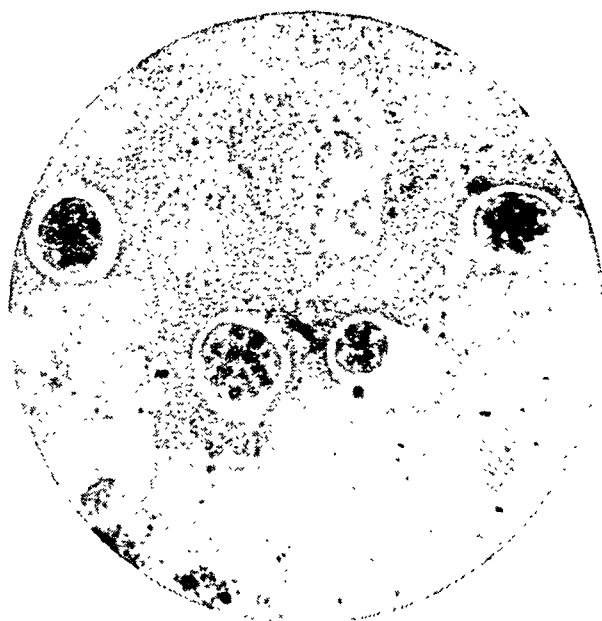


Fig. 2.—Spores in nasal secretion, Leishman's stain, showing the characteristic spherules. $\times 1,300$.

Duration of the disease in the authors' series

The duration, which as stated by the patients can only be taken as approximate, ranges from eight days to thirty-five years. In view of the chronicity of the disease and of the frequent failures at operative removal of the growths it

is surprising that there should be so many comparatively short histories and so few cases (only nine) of ten years' duration and over. If the stories told by numbers 4, 35 and 36 are true and if the history and observation of the signs of spontaneous retrogression in cases 14 and 53 are correct natural cure may partly account for this. In the villages visited the authors could only hear of two really old cases. It is also possible that the disease can cause death by suffocation and starvation for cases 6, 7, 12, 31, 46 and 47 were in a condition of considerable distress. In the case recorded by Forsyth there was apparently spontaneous healing of the disease in the nose about the time the skin became involved.

Concurrent infections in the authors' series

The patients in this series had a great objection to remaining in hospital and so it was not always possible to give each case a thorough overhauling. Case 5 was a leper, case 30 was suffering from an anæmia of pregnancy and case 34 had syphilis. The conjunctivitis of the left eye in case 58 was probably due to the irritation of dust for the lids could not be brought together properly owing to the size of the tumour.

Diagnosis of rhinosporidial infection

The diagnosis offers no difficulty. The finding on a mucous surface, especially in the nose or eye, of a papillomatous or villous polypus which appears to be wholly or in part composed of granulation tissue and which bleeds readily when touched should arouse suspicion. If on closer examination it is noticed that the surface

is covered with minute white spots the diagnosis of rhinosporidial infection is placed beyond doubt, for so far no other disease has been described with this feature. It is important to examine the hidden side of what appear to be common mucoid polypi. The growth should be gently squeezed with a pair of light, flat forceps and the blades should then be rubbed into a drop of saline on a slide, a coverslip placed over it and the preparation examined by the low power of a microscope, when the characteristic sporangia will be evident (figure 1). Alternatively the preparation may be stained by a Romanowsky stain and the spores containing the characteristic spherules seen (figure 2). Noronha states that hæmatoxylin gives better results and best of all is Heidenhain's iron hæmatoxylin stain.

Papillomatous warts and fungating tumours should be examined in a similar manner. It is not so easy for the naked eye to see the sporangia in the skin lesions, owing to the pigment of the epidermis.

The lymphatic glands are not enlarged in patients who are only suffering from rhinosporidial growths.

Summary of the authors' sixty cases

All of the following cases with the exception of case 48 have been diagnosed with the aid of the microscope.

In the authors' opinion cases should be followed up for three or four years before an absolute cure is claimed. The reason for this is that a recurrence may take a long time to manifest itself (see cases 1 and 42).

Summary of cases

No.	Sex	Age	Occupation	Position	Duration	Treatment	Remarks and result
1	F	30	Agriculture	Nose	3 months	1st snaring 2nd excision.	Small recurrence 18 months after snare was used. Nose clear 11 weeks after excision of this recurrence.
2	F	25	Washerwoman	Nose	8 months	Excision	Nose clear 11 months later.
3	F	8	d/o weaver	Nose	6 months	Snaring	Nose clear 8 months later.
4	F	50	Agriculture	Nose	6 months	Refused	Alleged spontaneous cure. Nose clear 7 months later.
5	M	22	Agriculture	Nose	8 months	Refused	History of previous operation and recurrence.
6	M	30	Agriculture	Nose, pharynx and skin.	Several years	Excision and neostibosan.	History of two previous operations on nose. Nose clear 6 months after neostibosan treatment, which however did not prevent two new skin growths.
7	M	30	Unknown	Nose and pharynx.	Unknown	Refused	Patient absconded before a proper history could be obtained.
8	M	18	Agriculture	Nose	4 years	Excision, electric cautery and neostibosan.	History of previous operation. The senior author's first operation was unsuccessful and patient was so difficult to deal with that subsequent treatment failed.
9	M	19	Vegetable growing.	Nose	1 year	Excision	Nose clear 6 months later.
10	F	30	Weaving	Nose	3 years	Excision and neostibosan.	One previous unsuccessful operation. Nose clear 3 months later.

Summary of cases—contd.

No.	Sex	Age	Occupation	Position	Duration	Treatment	Remarks and result
11	M	6	s/o Agriculturist and blanket maker.	Nose	7 months	Excision and neostibosan.	Nose clear 7 months later.
12	M	30	Agriculture	Nose and pharynx.	18 months	Refused	..
13	M	10	s/o Agriculturist	Nose	2 months	Excision	Nose clear 4 months later.
14	F	11	d/o Agriculturist	Eye	4 months	Refused	Growth appeared to be retrogressing spontaneously when seen again after 2 months.
15	F	50	Road sweeper	Nose	4 months	Excision	Nose clear 3 months later.
16	F	30	Agriculture	Nose	Unknown	Excision and neostibosan.	Nose clear 5 months later.
17	M	24	Agriculture	Nose	10 years	Snaring, excision and neostibosan.	Snaring was followed by a recurrence. Final result indecisive.
18	M	7	s/o Agriculturist	Nose	3 months	Excision and neostibosan.	Nose clear 4 months later.
19	M	20	Agriculture	Nose	9 years	Excision and neostibosan.	Nose still contained spores 5 months later. Failure.
20	M	25	Agriculture	Nose	3 years	Excision	Nose clear 2 months later.
21	M	18	Agriculture	Nose	8 to 10 years	Excision	History of a previous unsuccessful operation. Nose clear 1 month later.
22	M	9	s/o Agriculturist	Nose	1 year	Excision and neostibosan.	Patient's father neglected adequate treatment. Failure.
23	M	21	Student	Nose	9 years	Excision and neostibosan.	History of one previous unsuccessful operation. Nose clear 3 months later.
24	M	10	s/o Agriculturist	Nose	1 year	Excision and neostibosan.	Nose clear 4 months later.
25	F	55	Grain dealer	Nose	2 years	Excision	History of two previous unsuccessful operations. Nose clear 1 month later.
26	M	25	Coolie	Nose	5 years	Excision, electric cautery and neostibosan.	History of previous unsuccessful operation. Neostibosan was of no use in this case. Nose clear 3 months later. Credit due to electric cautery.
27	M	23	Agriculture	Nose	18 months	Excision	Nose clear 2 months later.
28	M	9	s/o Fisherman	Nose	5 to 6 years	Excision	Nose clear 2 months later.
29	M	40	Basket making	Nose	30 years	Refused	..
30	F	25	Agriculture	Nose	6 years	Excision and neostibosan.	History of two previous unsuccessful operations. Nose clear 2 months later.
31	M	35	Agriculture	Nose and skin	20 years	Excision and neostibosan.	History of four previous unsuccessful operations. Would not allow operative treatment to be completed. The authors' impression is that neostibosan caused the remaining warts to contract slightly.
32	M	25	Agriculture	Nose	1 year	Excision and neostibosan.	Nose clear 2 months later.
33	M	20	Agriculture	Nose	4 years	Excision and neostibosan.	History of two previous unsuccessful operations. Nose clear 2 months later.
34	M	25	Railways	Nose	1 year	Excision	Nose clear 2 months later.
35	F	30	Agriculture	Nose	8 years	Snuff composed of tobacco and lime.	Growth was removed for examination and showed evidence of healing. No spores in nasal secretion.
36	M	40	Agriculture	Nose	Several years	Snuff composed of tobacco and lime.	Apparent cure. No sporangia could be found in the growth.
37	M	9	s/o Agriculturist	Nose	3 years	Excision	Not seen again.
38	M	25	Agriculture	Nose	2 years	Excision	Not seen again.
39	M	20	Agriculture	Nose	5 years	Excision	Not seen again.
40	M	20	Agriculture	Nose	5 years	Excision	Operation was not complete, patient refused to come for further treatment.
41	M	30	Agriculture	Nose	4 years	Excision	Doubtful.
42	F	9	School girl	Nose	4 years	Excision	Not seen again.
43	M	50	Agriculture	Nose	35 years	Excision	Nose clear 3 weeks later.
44	M	12	s/o Agriculturist	Nose	4 years	Excision	Nose clear 2 weeks later.
45	M	18	Agriculture	Nose	10 years	Excision	Not seen again.

Summary of cases—concl'd.

No.	Sex	Age	Occupation	Position	Duration	Treatment	Remarks and result
46	F	22	Agriculture	Nose and pharynx.	10 to 15 years	Excision, electric cautery, foudin, entodon and neostibosan.	The electric cautery seemed to have been the most useful method of treatment in this case. Final result doubtful.
47	M	35	Agriculture	Nose, pharynx and larynx.	6 years	Excision, electric cautery, entodon and neostibosan.	Final result doubtful.
48	M	30	Weaving	Nose	4 years	Probably a snare	No recurrence for 14 years after third operation.
49	M	46	Agriculture	Nose	8 months	Excision, electric cautery and neostibosan.	Final result doubtful.
50	M	18	Agriculture	Nose	9 months	Excision	Spores reappeared in nasal secretion one month later.
51	F	30	Weaving	Nose	6 months	Excision	Nose clear 1 month later.
52	M	9	s/o Shopkeeper	Eye	1 year	Excision	Final result not known yet.
53	M	7	s/o Weaver	Eye	2 years	Excision	Possibly a case undergoing natural cure.
54	M	30	Agriculture	Nose	9 years	Excision	Final result not yet known.
55	M	10	s/o Agriculturist	Nose	6 months	Excision and neostibosan.	Final result not yet known.
56	M	7	s/o Agriculturist	Nose	1 year	Excision, electric cautery and neostibosan.	Final result not yet known.
57	M	13	s/o Clerk	Nose	8 days	Excision	Final result not yet known.
58	F	9	d/o Agriculturist	Eye	2 years	Excision	Final result not known.
59	M	8	s/o Goldsmith	Nose	1 year	Excision and electric cautery.	Final result not known.
60	M	9	s/o Shopkeeper	Nose	18 months	Excision and electric cautery.	Final result not known.

d/o = daughter of

s/o = son of

Case 1.—F., age 30, occupation agriculture, Drug district; was seen on 5th January, 1934, complaining that three months previously she had noticed a small tumour in her right nostril and that it was gradually increasing in size. Examination revealed a typical growth the size of a ground nut attached by a pedicle to the anterior end of the inferior turbinal. It was removed by means of a snare. She returned for examination on 26th June, 1935, and a small red papule was found on the floor of the right nostril level with the anterior end of the inferior turbinal. The surface of this papule was scraped and spores found, and as it was sessile it was dissected away together with a small area of surrounding mucous membrane. On 15th September, she was seen again and no sign of infection could be found in her nose and smears taken from her nasal secretion were negative.

Comment.—It is not certain whether this was a recurrence of the original growth which was perhaps inaccurately located, whether it was a recurrence caused by seeding of infection at the time of the first operation or whether, in view of the long period of 18 months after the first growth was removed and the small size of the second growth, it was a fresh infection.

Case 4.—F., age 50, occupation agriculture, near Raipur town; was seen on 27th December, 1934, complaining of a tumour in her left nostril. This was a typical growth and was said to have been present for 6 months. She was told to return next day for operation but failed to do so. On 6th July, 1935, she was seen again and no trace of any growth could be found in either nostril. She stated that a few days after her previous visit to the hospital the growth bled profusely for about 24 hours and that she then began to scratch at it. After a week or so it disappeared.

Comment.—If this story is true it is a case of spontaneous cure.

Case 5.—M., age 22, occupation land-owner and agriculturist, Raipur district; was seen on 23rd December, 1934. A typical growth protruded from his right

nostril. He stated that 8 years previously he suffered greatly from itching in his right nostril which gradually became blocked by the slow-growing tumour, and at times it bled very freely. In 1930 he had it operated upon but it recurred after a year. It was arranged that he should come next day for removal of the growth but he failed to turn up. On 3rd March, 1935, he was seen again and it was discovered that in addition to his nasal tumour he now had a macular skin eruption. He stated that he had been getting anti-syphilitic treatment in Lucknow but a skin clipping showed that the condition was due to leprosy and his Kahn test was negative. He would not believe us and all efforts to persuade him to let us treat him proved unavailing.

Comment.—A case of leprosy and infection with *rhinosporidium* in the same individual.

Case 6.—M., age 30, occupation agriculture, Drug district; was seen on 23rd December, 1934, when the photograph was taken (figure 3, case 6). A large growth which protruded externally blocked his right nostril and caused a lateral bulging of the right side of the nose about half-way down. He stated that this tumour started many years ago and had twice been operated upon. Another tumour the size and shape of a fresh ripe fig was seen in his naso-pharynx hanging from a pedicle, which was attached to the floor of the right posterior nares. This tumour, of which he made no complaint and did not know when it commenced, was greyish-yellow in colour and was covered by glistening mucous membrane except at the distal end where it showed rough pinkish coral-like excrescences. On the right side of the scrotum attached by a broad pedicle grew a somewhat similar tumour. Upon his left foot were what appeared to be three fungating masses of granulation tissue, which emitted a very foul odour. Two of the tumours were situated well up on the dorsum of the foot. The third, which he said was the first to appear as a small wart about six months previously, grew from the base of the second toe and on

account of its weight hung down over the toe. The whole foot was swollen as far as the ankle and he was in great pain, which made us think that there was involvement of the deeper tissues such as occurs in Madura foot. Spores could be demonstrated in the scrapings from all the lesions. Blood Kahn test was negative. His general condition was far from good. On 27th December, 1934, he was placed on the operating table, a needle was inserted into the cephalic vein of his right arm and 8 per cent glucose solution at 30 drops per minute was given throughout the operation under evipan anaesthesia. Owing to the difficulty the man experienced in breathing while under the anaesthetic the pharyngeal tumour had to be removed via the mouth, before the nose could be cleared, so that it was not possible to dissect away the base of the pedicle. After the pharynx had been cleared he was able to breathe satisfactorily. Two large nasal growths were next removed but bleeding was so fierce that the nose had to be packed and the remaining nasal polypi left for the time being. The left leg was then amputated and the patient returned to bed. A peculiar feature about the pharyngeal tumour was that it pulsed vigorously for about ten minutes after removal. It was incised and the contents appeared to be of a mucoid nature. The specimen unfortunately got damaged in transit to the laboratory and so no



Fig. 3.—Case 6.

report is available. Captain Pasricha of the Calcutta School of Tropical Medicine found that the condition of the foot was due to infection with *Rhinosporidium seberi*.

On 22nd January, 1935, the two remaining growths were removed from his right nostril. Of the four nasal growths two grew from the septum, one from the floor and one from the inferior turbinal which appeared to have atrophied as a result of pressure. On 25th February the scrotal tumour was excised and sent to Dr. Bharucha, Lecturer in Pathology at the Robertson Medical School, Nagpur, who kindly reported that typical sporangia were present.

Spores were still present in the nasal secretion of this patient and to obviate the danger of a recurrence of the growths in the nose it was decided to try the effect of intravenous injections of Bayer's neostibosan which was given as follows:—

28-2-35	0.2 gramme.	Spores present in nasal secretion.				
2-3-35	0.3	"	"	"	"	"
3-3-35	0.3	"	"	"	"	"
5-3-35	0.3	"	"	"	"	"
6-3-35	0.3	No	"	"	"	"
8-3-35	0.3	"	"	"	"	"

On 9th March a tiny, white, seed-like granule was picked off the posterior wall of the pharynx and pressed on a slide and it was found to contain sporangia but on this same date no spores could be found in his nasal secretion. On 10th March the man absconded and on 4th June, 1935, he was traced to his home where his nose and pharynx were examined and no trace of infection found. On the ala of his left nostril there was a small wart and on the right side of his chin another about the size of half a ground nut, the skin of which showed signs of early ulceration. A scraping from the latter growth showed sporangia. He stated that some time in January or February, while he was still in hospital, he was being shaved one day and his skin received a nick and the wart developed on the spot.

At first the man refused to return to hospital but finally consented to do so on 3rd July, when the cutaneous growths were excised. He was last seen on 27th September, 1935, when he seemed to be in excellent health.

His nose, pharynx and skin were all clear of any sign of infection.

Comment.—This was a severe case involving both skin and mucous membrane. Presumably he infected his skin from his nose by scratching. His general health had been undermined and there seems to be no doubt that the disease would have killed him in time. The result of the injections of neostibosan on the residual nasal infection appears to have been satisfactory but it had no effect in preventing the growth of the two warts on the face. This may have been due to inadequate dosage. The amputation of his foot was proved by the pathological examination to have been an unnecessary mutilation, but in extenuation the plea is advanced that there was no previous record of such a case to act as a guide.

Case 8.—M., age 18, occupation agriculture, Raipur district; was seen on 21st January, 1935, complaining that his right nostril had been obstructed by a tumour for the past four years. It was operated upon a year back but it quickly recurred. His right nostril was blocked by a typical growth. Next day at operation it was found that there were two polypi, both of which had short broad pedicles, the one being attached high up on the septum while the other took origin from the under surface of the inferior turbinal. Efforts at removal by dissection were marred by the very free bleeding which obscured the field of vision to such an extent that it was doubtful whether all the infected tissue had been removed. He refused to wait for any injections and went away the same day. On 9th June he was traced to his village where it was discovered that the growth on the inferior turbinal had recurred. He was persuaded to return to hospital and on 14th June an attempt was made to remove this tumour, which was long and thin. As soon as it was grasped in the forceps, prior to the dissection of its base from the turbinal, such fierce hæmorrhage commenced that it was not possible to remove the base cleanly under direct vision and the nostril had to be packed. Ten c.cm. of normal horse serum was injected subcutaneously. This specimen was partly pedunculated and partly sessile, one side of its attachment showing clear mucous membrane while the other was roughened and obviously infected. Two largish blood vessels were seen in the pedicle. On the next day the base of this tumour and the surrounding area was thoroughly treated with the electric cautery but as he disliked the smell he refused to let it be done again. On 13th and 14th June he had been given injections of 0.3 gramme neostibosan. On 17th and on 18th no spores could be found in his nasal secretion. On 17th August he was seen in his village and smears taken from his nose were negative, and on 20th September he was again seen in his village and although spores were found no recurrence of the growth could be seen. He refused to come to hospital for further investigation.

Comment.—This was a rather difficult case and owing to the re-appearance of spores it is probable that there will be a recurrence of the growths at some later

date. He should have been given a longer course of injections.

Case 11.—M., age 6, Raipur district; was seen on 4th March, 1935. His father stated that for the past 7 months he had noticed that the child was scratching his nose a good deal and that as a result it often bled. Under evipan-sodium anaesthesia a typical growth, which was attached by a broad pedicle, was dissected off the septum high up in the right nostril. Bleeding was so profuse that the specimen was damaged when the field of vision was obscured and it was not possible to be sure that all the infected tissue had been removed. The nostril had to be packed. As spores persisted in his nasal secretion he was given injections of neostibosan as follows:—

11-3-35	0.1 gramme.	Spores present.
13-3-35	0.15 "	" "
14-3-35	0.2 "	" "
15-3-35	0.2 "	No "spores" found.
16-3-35	0.2 "	" " "
18-3-35	0.2 "	" " "

Repeated examinations were made of his nasal secretion until 31st March, 1935, and as no spores could be found he was discharged as cured. He was seen again on the 10th October, his nostril appeared to be clear of any infection and no spores could be found in his nasal discharge.

Comment.—It is possible that the disappearance of the spores from his nasal discharge was due to the neostibosan. The result of treatment in this case appears to have been satisfactory.

Case 14.—F., age 11, Drug district; was seen on 4th April, 1935. It was stated that four months previously a 'pimple' was noticed under her left upper eyelid. On eversion of the lid a small, red, granular nodule, which was covered with minute white dots, was seen to be growing on the conjunctiva, midway between the centre and the inner canthus. The growth was sessile and scrapings revealed spores. This appeared to be a good case for the trial of neostibosan injections alone, but her father refused to allow her to remain and while the instruments were being prepared for the removal of the growth he managed to abscond with the child. On 28th June she was seen again and it was found that the nodule had practically disappeared. Her father could not be induced to say what, if any, treatment had been employed. A small roughened area was dissected off the conjunctiva and spores were demonstrated in it. On 27th August and on 15th October she was seen in her village. Her conjunctiva appeared to be quite healthy but she struggled so much that it was not possible to take any smears.

Comment.—Owing to the stupidity of the father of this patient it is not possible to say whether this infection was being overcome by the patient's own powers of resistance.

Case 15.—F., age 50, occupation street scavenger, Raipur town; was seen on 9th April, 1935, complaining of a tumour in her right nostril for the past four months. A typical growth, attached high up on the septum by a long, thin and apparently uninfected pedicle, was found blocking the nostril. She agreed to come for a course of injections of neostibosan which were given as follows:—

9-4-35	0.15 gramme.	17-4-35	0.2 gramme.
11-4-35	0.2 "	19-4-35	0.2 "
12-4-35	0.3 "	23-4-35	0.2 "

These injections appeared to cause the growth to shrink a little and to become less vascular but she felt so depressed that on 21st April the polypus was removed by cutting through the base of the pedicle. There was practically no bleeding. Examination of the specimen showed the pedicle to be free from infection. On 13th July her nose was free from all signs of infection.

Comment.—This case demonstrates that the effect of neostibosan is very slow and that a much more powerful drug is needed if simple cases are to be treated medically instead of surgically.

Case 16.—F., age 30, occupation agriculture, Drug district; was seen on 18th April, 1935, complaining of blockage of both nostrils which were found to be full of typical polypi. The same day dissection of multiple growths from the inferior and middle turbinals and from the septum was commenced but could not be completed owing to excessive hæmorrhage. On 24th April the remaining growths were excised as far as possible but as infected tissue remained she was given injections of neostibosan as follows:—

18-4-35	0.2 gramme.	22-4-35	0.3 gramme.
20-4-35	0.3 "	23-4-35	0.3 "
21-4-35	0.3 "	24-4-35	0.3 "

On this last date spores were still present in her nasal secretion but she refused to remain any longer in hospital. On 6th June, and on 15th September she was seen in her village where her nose was examined, a bone tag of mucous membrane was seen but no spores could be found in nasal scrapings or discharge.

Comment.—Such cases with extensive spread are difficult to treat surgically without considerable damage to the mucosa of the nose and in this case the effect of neostibosan appears to have been satisfactory.

Case 17.—M., age 24, occupation agriculture, Drug district; was seen on 24th June, 1935, complaining of obstruction of both nostrils: duration right nostril 10 years and left nostril 5 years. Each nostril contained a typical polypus growing from the floor. An assistant was allowed to remove the tumours which he did with a snare but on examination of the specimens it looked as if some infected tissue had been left behind. The man refused to wait for injections. On 20th July he reappeared and as spores could be expressed from the roughened mucosa of the nasal floor he was given injections of 0.2 gramme neostibosan on 21st and 22nd. On this latter date the nasal floor was scrubbed with 15 per cent silver nitrate solution but he went away again. On 9th October he was seen again and it was found that there was a smooth pale glistening polypus growing from half-way up the septum on the left side. This was dissected away and when it was subsequently examined it was seen that the proximal side, which was invisible from the front, displayed typical changes due to rhinosporidial infection. He was given injections of neostibosan as follows:—

9-10-35	0.3 gramme.	Spores +.
10-10-35	0.3 "	" +.
11-10-35	0.3 "	" +.
12-10-35	0.3 "	" +.
13-10-35	0.3 "	" +.
14-10-35	0.3 "	No spores.

He then went home.

Comment.—This case reveals that what may look like an ordinary mucous polypus may in reality be a rhinosporidial growth. As spores often persist in the nasal discharge for a few days after operation and then disappear spontaneously it cannot be claimed that neostibosan was effective here. It was given as an additional safeguard.

Case 18.—M., age 7, Raipur district; was seen on 1st May, 1935. It was stated that a tumour had been noticed in his right nostril for the past three months. A typical smallish sessile growth was seen attached to the nasal floor. Injections of neostibosan were given as follows:—

1-5-35	0.075 gramme.	5-5-35	0.2 gramme.
2-5-35	0.1 "	6-5-35	0.2 "
3-5-35	0.15 "	10-5-35	0.2 "
4-5-35	0.2 "		

The effect on the growth was so slight that on 13th May it was dissected away under surface anaesthesia and the base treated with the electric cautery. Injections of neostibosan were continued as follows:—

17-5-35	0.2 gramme.	23-5-35	0.2 gramme.
19-5-35	0.2 "		

He then ceased attending but was seen in his village on 14th June and 4th September. There was no sign of recurrence and smears were negative for spores.

Comment.—It was impossible to be certain whether neostibosan had any effect on this tumour.

Case 19.—M., age 20, occupation agriculture, Raipur district; was seen on 1st May, 1935, complaining of a growth in his right nostril for the past 9 years and in his left nostril for the past 6 months. Typical sessile polypi were seen, the one in the right nostril being attached to the anterior end of the inferior turbinal and the one in the left nostril to the anterior end of the septum. He was given injections of neostibosan as follows:—

1-5-35 0.2 gramme.	4-5-35 0.3 gramme.
2-5-35 0.2 "	5-5-35 0.3 "
3-5-35 0.3 "	6-5-35 0.3 "

This appeared to cause slight reduction in the size of the growths but progress, if any, was so slow that he was becoming restive and so on 7th May both tumours were dissected away. On the 9th spores were still present in the secretion from both nostrils, but on the 10th they were only present in the secretion from the right nostril so he was given an injection of 0.3 gramme neostibosan. On the 12th and 13th no spores could be found at all and he went away. On 16th October he was seen again. Both nostrils appeared normal but spores were found in the secretion. He was given injections of neostibosan, 0.3 gramme on four successive days. At the end of this time spores still could be found in the secretion from his left nostril and he went home in disgust.

Comment.—It appears as though neostibosan had no effect whatever in this case. It is surprising that he should be secreting spores from an apparently healthy nose. There must have been some cryptic source, for though his nose was examined several times with great care, nothing abnormal could be seen.

Case 20.—M., age 25, occupation agriculture, Raipur district; was seen on 7th June, 1935, with a typical growth, said to have been present for 3 years, attached by an apparently uninfected pedicle to the septum of his right nostril. Ten c.cm. of normal horse serum was injected subcutaneously and the base of the pedicle together with some surrounding mucous membrane was dissected away. The bare area was mopped with 15 per cent silver nitrate solution. When the specimen was examined it was seen that, although the anterior surface of the pedicle was covered with healthy mucosa, infected tissue was spreading from the pedicle on to the nasal wall. The anterior aspect of the pedicle was considerably longer than the posterior. He was seen again on the 12th July and 9th August and nothing abnormal could be found in his nose and his nasal secretion was free from spores.

Comment.—Examination of this specimen illustrates the necessity for removing a good sweep of mucosa along with the base of the pedicle, if recurrence is to be avoided.

Case 22.—M., age 9, was seen on 14th June, 1935; he was found to have a typical polypus in his left nostril which was said to have been present for one year. His father brought him to Raipur next day and after an injection of 10 c.cm. normal horse serum an attempt was made to dissect away the growth which consisted of several loose, friable, sponge-like fronds attached without any definite pedicle to the under surface of the inferior turbinal. During removal the tumour came to pieces whenever touched by forceps, and bleeding, which was very brisk, greatly impeded the operation. Infected tissue was certainly left behind. The region of attachment was then thoroughly scrubbed with 15 per cent silver nitrate solution. His father would not let him remain for injections but brought him back on 12th July when spores were found in his nasal secretion. On three successive days he was given injections of 0.2 gramme neostibosan and then again disappeared. On 29th July he was seen again and as spores were still present he was given another three injections before he absconded. On 4th September he was seen in the village and spores were still present.

Comment.—Neostibosan appears to have been a failure in this case though it must be admitted that the treatment was intermittent owing to the stupidity of the child's father.

Case 23.—M., age 21, occupation student, Bilaspur; was seen on 16th June, 1935, with a typical growth attached to the floor of his left nostril. He stated that he left his village in Drug district in 1925. In February 1926 when he was a boarder at the Government High School, Raipur, he noticed that there was a tumour in his nostril. It gradually enlarged and in 1933 it was partially removed at the main hospital but continued to grow. After an injection of 10 c.cm. normal horse serum the growth was dissected away and the floor swabbed with 15 per cent silver nitrate solution. Bleeding was very free. The area of attachment of this growth was one inch in length by one-quarter of an inch in width. The pedicle was not entirely free of infection. The anterior end of the tumour was firm and closely-set like a strawberry, the posterior end was loose and very friable, while the middle portion was of a mucoid cystic nature. He was given six daily injections of 0.2 gramme neostibosan and then, as no spores could be found in his nasal secretion, he left hospital. On 29th and 30th September he was seen again. Both nostrils seemed to be quite healthy and no spores could be found.

Comment.—It is uncertain whether he acquired his infection in his village or in Raipur town.

Case 29.—M., age about 40, occupation making bamboo baskets. He appeared to have an ordinary smooth, glistening mucous polypus in his left nostril but after a little manipulation a fringe of typical rhinosporidium-infected tissue could be brought into view from behind the mucoid mass. He stated that the tumour had been present for about 30 years and that at intervals when it becomes large and protrudes a piece breaks off. At times there is considerable hæmorrhage. He did not wish to have the growth removed.

Comment.—This case is of interest owing to the length of time the growth has been present.

Case 30.—F., age 25, occupation agriculture, Raipur district; was seen on 6th July, 1935. Her left nostril contained a typical growth attached by a pedicle to the angle between the septum and the roof. She said that it had been present for six years and that it had twice been operated upon. It was removed by dissection and she was given six daily injections of neostibosan 0.3 gramme, because during the operation the bleeding was so fierce that it was not possible to be certain that all infected tissue was removed. She was eight months' pregnant, anæmic, had fissures at the angles of her mouth and her tongue was sore and glazed, but her blood Kahn test was negative and she had no palpable glands. She was given a large jar of Virol and was seen again on 2nd August by which time her general condition had greatly improved and her mouth was better; she was given more Virol. Her nostril looked quite healthy and no spores could be found in it. On 31st August she was seen in her village. Although she was up to term she was working in the fields and her nostril appeared clear of all signs of infection.

Comment.—Nil.

Case 31.—M., age 35, occupation agriculture, Drug district, came to hospital on 7th July, 1935, when the photographs (figure 4) were taken. He stated that about 20 years ago a swelling was noticed on the left side of the bridge of his nose. His father had it 'branded'. Some time later a granular mass commenced to protrude from his left nostril. Some years later he went to the main hospital, Drug, where it was operated upon but it quickly recurred. A couple of years later he had it operated upon at the branch dispensary, Gunderdehi, but again it recurred and increased in size. He returned to Gunderdehi for another operation of which the only result was an increase in size of the growth, which now began to spread to the skin around the nostril. He then tried the branch dispensary at Balod where the growths were

cut off. This was about 5 years ago and as there was again rapid recurrence he became despondent, for each operation appeared to be followed by exacerbations of the disease. Between 2 and 3 years ago his condition was diagnosed as syphilis and he was given three injections which produced no result. About a year back the warts began to appear on his face and body. Some six months ago his upper lip became infected. More warts continued to appear on his face and body. His left anterior nostril was surrounded by a ring of warty cauliflower-like growths in the centre of which a kind of crater had been formed. There was an elephantoid enlargement of the left two-thirds of the upper lip which was partly covered by smooth skin and mucous membrane and partly by ulcerated areas of infection. There was a large warty growth on each side of the nose, one below the inner canthus of the left eye, one above the outer end of the right eye, one on the left side of the forehead, one on the pinna of the right ear, several on the left cheek, one in the centre of the neck and one on each side of the neck, two on the right side of the lower lip, several small ones on the right cheek, one on the left arm just above the elbow and one on the sole of the right foot. Two had been cut off the left side of his waist line. Below

wounds healed well and the injections of neostibosan were continued for seven days. On 3rd August he was to have been prepared for further operation on the next day but he refused and absconded on the 5th. On 22nd October he was seen again. He stated that he was in excellent health and he was able to walk without any trouble, which he had been unable to do when he left hospital in August. The warts which had not been removed were still there but gave the impression that they had dried up somewhat. He refused to allow any of them to be removed for pathological examination. Photographs were then taken and he went home. Dr. A. J. Noronha of Poona has informed us that in sections of these warts he has found large numbers of foreign-body giant cells around sporangia, a feature which he has not previously met in his extensive experience of examining rhinosporidial tumours. Krauss found foreign-body giant cells in the first North American case.

Comment.—This was a serious and most interesting case. His general condition when he first came to the main hospital, Raipur, was far from satisfactory. His suffering had apparently affected his health. It is difficult to account for the oozing of blood which took place from the growths on the 10th and 11th of July,

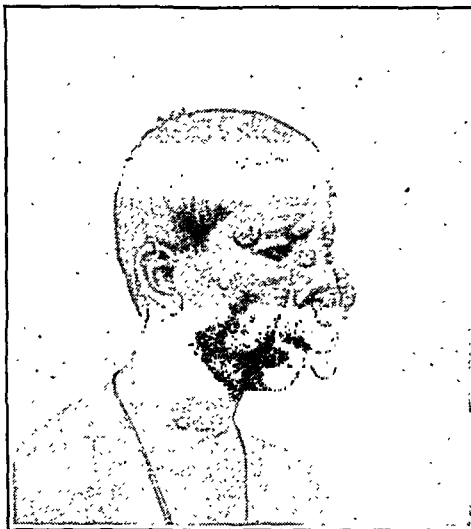
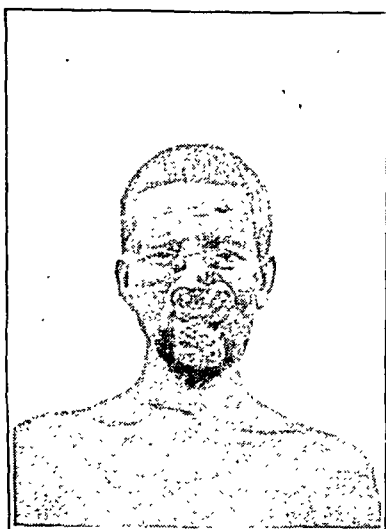


Fig. 4.—Case 31. Before operation.

his left eye there hung a bag of what appeared to be myxomatous tissue covered by smooth skin. He was given a generous mixed diet and given Virol, calcium and daily injections of 0.3 gramme neostibosan for three days. On 10th July there was considerable oozing of blood from the growths in his nose and on his lips, so much so that 20 c.cm. normal horse serum was injected. Oozing continued and the injections of neostibosan were stopped until 17th July, when they were given again for four days. On 20th, after a preliminary dose of morphine and scopolamine, he was anaesthetized with rectal ether and paraldehyde and the following growths removed by dissection:—Elephantoid enlargement of upper lip, two growths from lower lip, fungating growth from anterior nares, large warty growths from each side of the nose, growth from below inner canthus of left eye, myxomatous bag from below the left eye, growth from above outer end of right eye, growth from left side of forehead, tiny new wart from centre of forehead and collection of growths from left cheek. As hæmorrhage had been rather severe and the patient's pulse was not good he was given a pint of gum-saline solution intravenously after he was returned to bed. This improved his pulse for the time being but later in the evening his condition gave rise to some anxiety and he had to be given an injection of camphor-in-oil. Subsequently the face

It may have been caused by the injections of neostibosan though it has never been found to cause such oozing in other patients. Although unable to prove it the authors are of the opinion that there was a shrinking of the remaining warts by the time of his second visit and that this was probably due to the injections of neostibosan. The photographs (figure 5) show his condition at the time of his second visit.

Case 34.—M., age 25, employed on the railway, Raipur town; was seen with a typical growth attached to the anterior end of the inferior turbinal of his left nostril. About a year ago he noticed that his nose would bleed if he sneezed violently and some months later he noticed a 'pimple' in his nostril. About this time he developed an ulcer on the ala of his left nostril which commenced to erode the tissues. When he lost the whole of the ala he attended the main hospital where on 4th May, 1935, his Kahn test being found strongly positive, he was given a course of injections of sulphostab and casbis. As the gummatous ulceration cleared up the rhinosporidial growth, upon which neither sulphostab nor casbis was having any effect, became very obvious. He was ordered calcium lactate 20 grs., t.d.s., for three days and on 21st July the growth, which had a short and uninfected pedicle, was removed by dissection. Bleeding was so profuse that the nostril had to be packed. On 8th October his nose

was examined and found quite clear of infection. Smears were also negative for spores.

Comment.—Anti-syphilitic treatment with arsenic and bismuth had no effect on this rhinosporidial growth.

Case 35.—F., age 30, Drug district; was seen in her village on 28th July, 1935. She stated that about 13 years ago a tumour, which obstructed her breathing,

resembled a rhinosporidial growth. No spores could be found in her nasal secretion. The polypus was removed by dissection for histological examination and we are indebted to Dr. A. J. Noronha who reported the presence of typical sporangia.

Comment.—It is possible that this is a growth undergoing cure by fibrosis due either to the snuff or to the natural resistance of the patient.

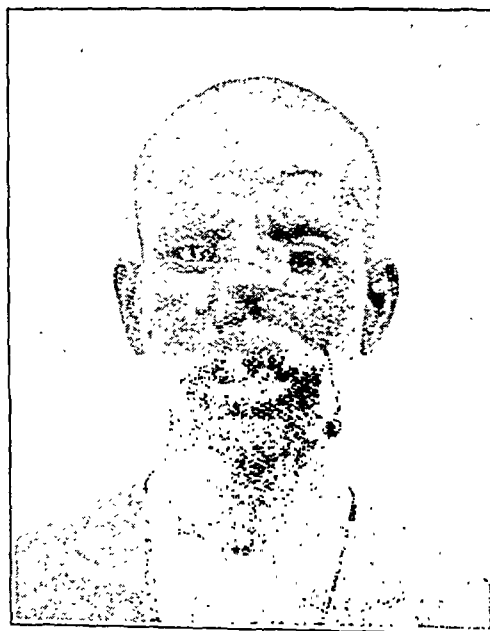
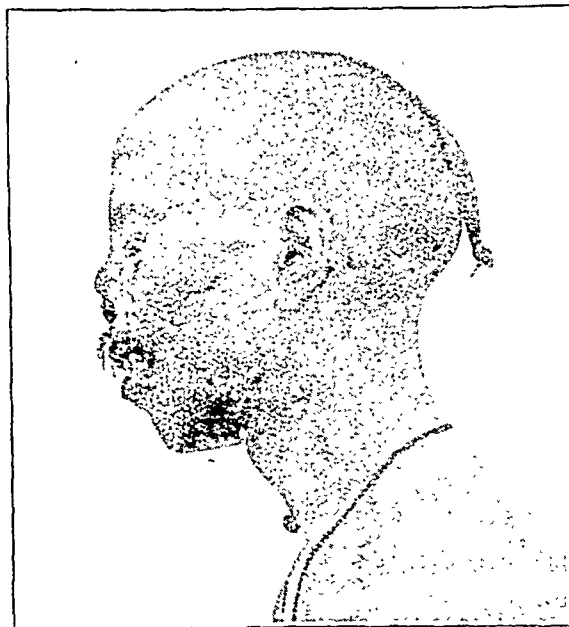


Fig. 5.—Case 31. After operation.

developed in her right nostril. About a year after its appearance she went to Raipur where it was operated upon. It grew slowly again, but for the past five years it had not increased in size. She attributed the cessation of growth to the use of a snuff composed of pounded tobacco leaves and lime. Examination of her right nostril revealed a pink, smooth, multilobular polypus attached by a pedicle to the anterior end of the septum. Except for its light colour this polypus

Case 36.—M., age 40, occupation agriculture; was seen in his village on 28th July, 1935. He stated that when he was about 12 years of age a tumour appeared in his left nostril. This tumour obstructed his breathing and used to bleed readily if scratched. After a few years it disappeared leaving a small nodule on the floor of the nostril. He attributed the cure to the use of a snuff composed of pounded tobacco leaves and lime. His nostril was examined and a small sessile

nodule was removed from the floor. No spores could be found in his nasal secretion. We have to thank Dr. A. J. Noronha for the following report:—

'The architecture of this tumour is that of a rhinosporidial polypus. No sporangia are present but cavities similar to those noticed in case 35 can be seen. The formation of fibrous tissue can be discerned'.

Comment.—This would appear to be a case of either spontaneous cure or of cure due to the snuff.

Case 41.—M., age 30, occupation agriculture, Drug district; was seen in his village on 28th July, 1935. He stated that about 4 years ago he suffered from a sensation as if something were biting him in his left nostril and a little while later he discovered that there was a tumour there. Nothing was visible externally but on inserting a speculum what appeared to be a pale, pink, glistening mucous polypus was seen suspended by a pedicle from the ethmoidal region. After removal by severing its pedicle a pale, pink, racemose collection of tissue was seen behind also hanging from the ethmoidal region. In colour this mass was quite unlike the usual rhinosporidial nasal growths but its configuration aroused suspicion. Efforts at complete removal by dissection were frustrated by the extreme friability of the growth. As spores and sporangia were found on microscopic examination he was advised to come to Raipur for treatment by the electric cautery but he did not do so. On 15th September he was again seen in his village, no sign of infected tissue could be seen and carefully taken smears were negative for spores.

Comment.—We should have liked to have seen him again after a few more months to make sure that the operation was really more successful than appeared at the time it was performed.

Case 42.—F., age 9, occupation school, Raipur town; was seen on 16th August, 1935. In her left nostril she had a typical small polypus hanging by a long thin pedicle from the septum above the level of the middle turbinal. Her father stated that the growth was first noticed when they were living in Bilaspur in 1931 and that it was operated upon there in 1932. Its recurrence was first noticed in February 1935. It was decided to try the effect of iodine and on 8th and 11th September she was given intramuscular injections of 2 c.cm. Bayer's endodine (entodon). She stated that the injections gave her fever and refused to have any more. From 16th to 25th September her nostril was thoroughly irrigated daily with 0.5 per cent solution of para-nitrophenol. She got tired of this and as it did not appear to be producing any good result the base of the pedicle was clamped and severed. After removal the specimen was examined and as the pedicle was free from all signs of infection it is improbable that any infected tissue was left behind.

Comment.—The action of para-nitrophenol, even if it were proved to be effective, is too slow in this type of disease to be of any value.

Case 45.—M., age 18, occupation agriculture, Raipur district; was seen in his village on 4th September, 1935. His left nostril was partially blocked by what appeared to be a mucous polypus springing from a broad base which stretched across from the upper part of the septum to the lateral wall. He stated that it was first noticed about ten years ago and that two years later someone in Neora village operated upon it. It soon recurred and continued to grow slowly until about a year ago since when he thought its size had not increased. He was brought to Raipur and next day the tumour was easily dissected away without excessive hæmorrhage. The specimen was examined after removal and it was seen that although the distal side was covered by pale, glistening and apparently uninfected mucosa on the proximal side there were to be seen some small, rough, red villi from which spores and sporangia could be obtained. The pedicle was free of infection and no infected tissue was left behind.

Comment.—This case shows that in India all mucous polypi of the nose should be carefully examined for possible rhinosporidial infection.

Case 46.—F., age 22, occupation agriculture; was seen in her village on 4th September, 1935. Both her nostrils were blocked, the right one by a large typical cauliflower-like growth and the left one by a mucoid enlargement of the septum. She stated that she had had the growth in her right nostril for ten or fifteen years but that her left nostril had only become occluded about a year ago. Next day an attempt was made to dissect away the growth from the right nostril but it failed, partly owing to the very extensive origin of attachment which covered part of the floor and almost the whole of the septum for an inch and a half back, partly owing to the extremely friable nature of the growth and partly owing to the fierce hæmorrhage which necessitated the nostril being packed. It was decided to try Bayer's trivalent antimony preparation, foudadin, instead of the pentavalent neostibosan and the following injections were given:—

6-9-35	1.0 c.cm.	10-9-35	2.0 c.cm.	16-9-35	3.5 c.cm.
7-9-35	1.5 "	11-9-35	2.0 "	17-9-35	4.0 "
8-9-35	1.5 "	12-9-35	2.5 "	18-9-35	4.0 "
9-9-35	2.0 "	14-9-35	3.0 "	21-9-35	4.5 "

On 7th September an attempt was made to remove a mucoid polypus, which was hanging from the back of her nose into her pharynx, through the right nostril, but bleeding from the nostril prevented the location of its point of attachment and it had to be taken away by avulsion of the pedicle, via the mouth. On 21st September spores and sporangia were still present in large numbers in the secretion from her right nostril. Between 22nd and 25th September she was given four daily injections of 2 c.cm. entodon (Bayer) without any apparent effect on the spores. Between 26th September and 12th October she was given 12 injections of 0.3 gramme neostibosan. On 30th September no spores could be found but a few were seen on 2nd October and again on the next day they could not be found. On 4th October unhealthy areas in the right nostril and the mucoid enlargement of the septum in the left nostril were treated by the electric cautery which caused severe bleeding and the nostrils had to be packed. The electric cautery was again employed on the 11th and 18th October and by the 20th, as no spores had been found on several examinations, she went home. At this time no obviously infected tissue could be seen in her nostrils. The pressure of the growth in the right nostril had so greatly displaced the septum to the left that she could hardly breathe through the left nostril and by looking down the right nostril one could see the posterior wall of the naso-pharynx, without any speculum.

Comment.—This was a serious case with extensive involvement of the nasal mucosa. Neither entodon nor foudadin appeared to have any effect on the excretion of spores. The result of treatment with neostibosan was encouraging as there did seem to be some reduction in the number of spores in the nasal secretion. After preliminary excision with the knife the electric cautery was the quickest and most handy agency for the destruction of the spore-producing areas.

Case 47.—M., age 35, occupation agriculture, Drug district; was seen on 16th September, 1935. Both nostrils contained typical growths and when he opened his mouth a large papillomatous mass could be seen hanging from his naso-pharynx. There were two small warts on the skin between his right nostril and lip. He stated that he first noticed the growth in his left nostril six years ago and in his right nostril three years ago. He did not realize that he had a growth in his pharynx. Several operations had been performed on the nasal growths but they always recurred rapidly. A large villous papilloma, which was partly sessile and partly pedunculated, was easily dissected off the right side of the septum though hæmorrhage was very free. The patient experienced great difficulty in breathing when asked to hold up his head but denied having any growth in the throat. This trouble with his breathing made the operation somewhat arduous for both operator and patient. The left nostril

contained a collection of sessile villi springing from the roof and a large, partly sessile, partly pedunculated papilloma attached to the inferior turbinal. Owing to fierce bleeding and the inability of the patient to keep his head up for more than a few seconds at a time it was not possible to dissect these growths away cleanly. An effort to excise the base of the nasopharyngeal growth through the nostril, in order to remove it cleanly *via* the mouth, proved ineffectual for similar reasons. The growth got torn, bled profusely and had to be removed piecemeal. Before anything further could be done the patient fainted and refused to sit up again. Next day, despite his protest that there was nothing in it, his throat was examined and the laryngoscope revealed a villous growth, resembling a papilloma of the bladder, which was attached by a pedicle to the left *aditus laryngis* about a quarter of an inch above the ventricular fold. Some of the longer villi hung down between the vocal cords but when the patient coughed the whole growth was shot up over the epiglottis. On 18th September under rectal ether-paraldehyde anaesthesia laryngo-fissure was performed and the pedicle of the growth clamped, cut and sewn to control the very free hæmorrhage. As far as could be ascertained by the eye no infected tissue was left behind. The two warts were removed from his face. Recovery after operation was uneventful. Between 18th and 28th September he was given nine injections of 2 c.cm. entodon without any apparent result on the excretion of spores from his left nostril. Between 29th September and 12th October he was given 12 injections of 0.3 gramme neostibosan. On 4th, 11th and 14th October the electric cautery was employed in an effort to destroy the remaining areas of infected mucosa in the left nostril. On 18th October another growth was found in his right nostril attached about an inch from the anterior end of the inferior turbinal. It appeared that on 16th September there was only one growth in his right nostril and that it was removed from the septum but it is possible that a very small growth might have been overlooked and that it grew bigger in the interval. This last growth was removed by dissection and together with one of the first growths removed it was sent to Dr. Noronha, who reported the tumour removed on 16th September to be an actively growing rhinosporidial polypus whereas the tumour removed on 18th October although highly vascular contained no spores or sporangia. The patient absconded on 19th October before it was certain that his nose was free from infection.

Comment.—In this case the growth in the larynx may have led to the eventual death of the patient by suffocation. It is doubtful whether the entodon had any effect; we are inclined to think that it had none but definite proof is lacking. The reason for the absence of spores or sporangia from the tumour removed on 18th October is difficult to explain. All the other growths removed were of rhinosporidial origin and it is difficult to believe that such a vascular polypus would be of another origin. It is possible that the neostibosan caused the disappearance of spores and sporangia or possibly the combination of neostibosan and entodon was responsible, but as it is not known whether they were present in this last growth removed before treatment commenced this can only be considered as a guess.

Case 49.—M., age 46, occupation agriculture; was seen in his village on 17th September, 1935, where he was found to have a typical growth hanging from the roof of his left nostril level with the anterior end of the middle turbinal. He first noticed this growth 8 months previously. He was brought to Raipur and the next day an attempt to remove the growth by dissection was marred because he fainted and vomited. Infected tissue was left behind but he insisted on going home. He returned on 8th October complaining of repeated attacks of epistaxis. Examination of his left nostril revealed infected mucosa on the upper part of the septum, the roof of the nostril, the middle turbinal and superior turbinal. The electric cautery was applied until the bleeding extinguished it. It was

repeated on 11th October with greater success because the bleeding was much less. From 9th October he was given six daily injections of 0.3 gramme neostibosan and on the 15th, as no spores could be found in his nasal discharge, he went home.

Comment.—It would have been very difficult to deal with this case without the help of the electric cautery or of some drug with a selective action on the parasite.

Case 50.—M., age 18, occupation agriculture; was seen on 17th September, 1935, when he was found to have a typical growth attached to the upper part of the septum in his right nostril. He stated that he first noticed the tumour nine months ago and that two months ago it had been operated upon at Drug. He was brought to Raipur and next day the growth, which had a short uninfected pedicle, was easily removed by dissection. On 21st September as his nostril appeared to be free from infected tissue and no spores could be found in the secretion he was allowed to go home. On 15th October he was seen again in his village and although his nostril looked quite healthy, spores were found in the secretion. He could not however be persuaded to come to Raipur again for further investigation.

Comment.—The reappearance of spores in an apparently healthy nostril was most surprising.

Case 55.—M., age 10, Drug district; was seen on 28th September, 1935. A typical growth, which was stated to have been present for 6 months, so completely blocked his left nostril that its point of attachment could not be accurately located. Under surface anaesthesia an attempt was made to dissect away the growth but owing to the struggles of the patient the specimen got broken and the very free hæmorrhage prevented thorough examination. It seemed probable that infected tissue was left. From 28th September to 4th October he was given daily injections of 0.2 gramme neostibosan. On 1st and 2nd October no spores could be found in his nasal secretion and as his nostril appeared to be quite clear of all infected tissue he was allowed to go home.

Comment.—Such cases are difficult to treat in children owing to the smallness of the nostril in which one has to work.

Treatment of rhinosporidium infections

From a study of the pathology of the tumour it is evident that, as there is no deep infiltration, excision of the infected areas should result in a permanent cure. This is true enough in early cases and presents no difficulty. In later cases where infection has spread over a relatively large area or where multiple sites of infection have occurred the complete removal of infected tissue becomes more difficult and may necessitate a serious operation. The ideal treatment in such cases and even in the early ones would be medicinal or possibly by means of radiation or electricity, provided the treatment is expeditious. Wright suggested instillation of antimony tartrate in conjunctival cases but after initial success he came to the conclusion that this drug was not a specific cure. Norrie tried urea stibamine in one case without any benefit to the patient. In the series reported here it was desired to try the effects of various drugs, principally iodine and antimony compounds. Unfortunately the demands of the patients did not always allow this.

Thus surgical treatment had to be tried first, and only in the late cases where ablation of the growth would result in gross deformity would medicinal treatment be accepted.

It is greatly to be regretted that neither therapeutic x-rays, radium, electrolysis nor diathermy were available for trial in the treatment of this series of cases.

The treatment employed for growths in accessible areas is removal by dissection along with a surrounding area of healthy mucous membrane and it is simple, quick and efficacious. The common practice of using a snare for removal of rhinosporidial granulomata from mucous surfaces, a practice unfortunately recommended in some textbooks, cannot be too strongly condemned as it is very liable to be followed by a recurrence of the growth, owing to incomplete removal though in some lucky instances it may be successful.

In the more extensive infections or when the granulomata are situated in the more inaccessible situations complete removal by means of knife or scissors becomes uncertain, especially as it is difficult to assess the extent of infected mucosa on the deep side of the growth before removal is commenced and because of the hæmorrhage, which later obscures the field of vision. In such cases electrolysis with a zinc needle or diathermy is advocated by Norrie, if available. Otherwise as thorough a clearance of infected tissue as possible should be carried out by dissection and the area cauterized by electric cautery or caustic. If this is unsuccessful, as shown by persistence of spores in the nasal or other secretion, it is essential to attempt either more radical surgical measures, which may result in great disfigurement, or else to employ some drug. In this series a trial was first made of neostibosan. The reason for this choice was the statement in Connors' 'Surgery in the Tropics' that Wright had advocated injections of antimony tartrate. It was afterwards learnt from Lieut.-Colonel Wright, I.M.S., that what he really recommended was instillations of antimony tartrate into the conjunctival sac.

The results of treatment with neostibosan may be provisionally considered satisfactory in cases 6, 11 and 16. In these cases spores persisted in the nasal secretion after operation and subsequently disappeared after 6 injections of neostibosan.

In some cases it was considered that infected tissue might have been left behind and so neostibosan was given, but owing to the presence of scabs and continued bleeding the actual persistence of spores before commencement of neostibosan treatment could not be proved. In these cases therefore it is possible that neostibosan may have helped to destroy the parasites left behind after incomplete removal of the infected tissue by operation.

Neostibosan had apparently no effect whatsoever in preventing the occurrence and enlargement of the skin infection of the face in case 6, though apparently clearing up his nasal lesions which had persisted after operative intervention. Neostibosan appears to have failed in other cases. In these it would have been desirable

to continue the injections for some little time longer had the patients been willing. Extensive treatment with the electric cautery had to be substituted in case 26 to try and avoid letting him go away with the certainty of a widespread recurrence.

In cases 15, 18 and 19, neostibosan was given before operative intervention but the effect, if any, was too slight to warrant its continuation to the exclusion of the knife.

In case 31 no definite result could be determined in the skin lesions as a result of neostibosan injections. In view of the disfigurement and suffering caused to this case, by surgical removal of all diseased tissue, the necessity for the discovery of a really effective anti-rhinosporidial drug is obvious. In cases 46, 47, 49 and 56 it was not possible to be certain of the value of neostibosan, though in the first of these it appeared to cause a reduction in the number of spores excreted.

Irrigation of the growth in the nose with para-nitrophenol was tried in one case without any benefit.

Sulphostab (Boots) and casbis (Bayer) was without effect on the nasal growth of case 34.

Fouadin (Bayer), a trivalent preparation of antimony, was employed in one case but no noticeable effect was produced.

Entodon (Bayer), an iodine preparation for intramuscular injection, was tried in two cases but no benefit was apparent.

The very free and persistent bleeding, which is so liable to attend the surgical treatment of rhinosporidial infections of mucous surfaces, can to some extent be reduced by the preliminary exhibition of calcium in large doses for a week and the injection of 10 c.cm. of normal horse serum prior to the commencement of the operation. The application of adrenalin solutions to the bleeding surfaces appeared to be of little or no use, whereas hydrogen peroxide helped temporarily to reduce the hæmorrhage and enabled a clearer view to be obtained during removal of the growth.

Most cases will in all probability be seen and treated by private practitioners who cannot, owing to distance and the financial condition of the patient, send these people to an ophthalmologist, rhinologist or laryngologist. In these circumstances the best line of treatment would seem to be excision of the growth by dissection as far as possible, and the subsequent exhibition of ten or more daily injections of neostibosan. For early skin cases local excision alone is sufficient. More complicated cases will have to be sent to hospital. A more rapidly acting and more powerful drug than neostibosan is however badly needed.

Summary and conclusions

1. Rhinosporidium has been assigned by Ashworth to the lower fungi (*Phycomycetes*) such as the *Chytridineæ* and has been provisionally placed near the *Olpidiaceæ*.

2. In man, cattle and equines it causes an exfoliative, non-infiltrating granuloma usually situated in the nose, but also occurring in the pharynx and larynx, on the fauces and uvula, in the ear and lacrimal sac, on the conjunctiva and the mucous membrane of the glans penis and on the skin.

3. The occurrence of these granulomata have been reported from Asia (India, south of a line joining Bombay and Benares, Ceylon, the Philippine Islands and possibly China, Japan and the Malay States), from North America (the United States), from South America (the Argentine, Paraguay and Uruguay), from Africa (the Union of South Africa), and from Europe (Lombardy). It seems probable that the distribution is much wider than this, cases being overlooked.

4. The mode of infection is not known but transmission by either water or dust appears to be probable.

5. The authors have given reasons for believing that natural cure may sometimes take place.

6. Diagnosis is easy and consists of noticing the minute white sporangia on the surface of the growth and of finding the spores, containing the characteristic 10 to 16 refringent spherules, in stained smears of the secretion therefrom.

7. Sixty cases, investigated by the authors, are reported.

8. The treatment of early single growths in accessible situations is simple and consists of clean excision of the growths together with the surrounding areas of healthy mucous membrane or skin.

9. Treatment of the growths in inaccessible situations and of multiple growths is not so satisfactory. It consists in excision of the growths, the employment of the electric cautery for the destruction of the surrounding areas of infected mucosa and of the injection of 2 to 4 grammes of neostibosan (Bayer) in 0.3 gramme doses intravenously (adult dose) with the object of trying to kill the parasite.

10. The authors' cases have not been followed up for a sufficiently long period of time to enable any absolute cures to be claimed but the results reported appear to be promising.

11. Neostibosan is not effective in all cases and therefore a more powerful parasiticide is required, preferably one of which a single dose will prevent the development of the spores into sporangia.

12. Sulphostab (Boots), casbis (Bayer), entodon (Bayer), fouadin (Bayer) and paranitrophenol have been tried by the authors, and urea stibamine (Brahmachari) has been tried by Norrie in isolated cases without encouraging results.

13. Two patients stated that a snuff composed of pounded tobacco leaves and lime was bringing about a cure and their claim seems to be supported by the pathological report. This

line of treatment, even if proved to be sure, would be very slow.

Acknowledgments

Our thanks are due to Dr. L. L. Griffiths of Dublin for the microphotographs of the spores and the sporangium, to Dr. A. J. Noronha of Poona for reports, advice and assistance, to Captain C. L. Pasricha, I.M.S., for reports and assistance, to Dr. N. H. Bharucha of Nagpur and Captain M. S. Katre, late I.M.S., for reports, and to Lieut.-Col. R. E. Wright, I.M.S., Lieut.-Col. F. O'Kinealy, I.M.S. (retd.), the Librarian of the British Medical Association and the Librarian of the London School of Hygiene and Tropical Medicine for advice and assistance.

Finally our thanks are due to Mr. E. V. A. Peers, M.A., I.P., D.S.P., Raipur, and to Mr. A. N. P. Jones, I.P., D.S.P., Drug, without whose assistance it would not have been possible to trace and follow up many of the cases.

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IMMUNOLOGICAL METHODS IN THE DETERMINATION OF INFECTION IN A RANDOM SAMPLE OF HOSPITAL ADMISSIONS

PART III

(THE FREQUENCY AND CONCENTRATION OF AGGLUTININS FOR *Bact. pseudo-carolinus* IN A SERIES OF 218 HOSPITAL PATIENTS)

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PASRICHA AND PANJA (1936) showed that one of the most frequent non-lactose-fermenting organisms isolated during the routine examination of hospital patients in Calcutta is *Bact. pseudo-carolinus*. This bacillus was found in approximately seven per cent of the patients admitted into the hospital. In order to determine, to some extent, the degree of infection by the organism in the population at large, we carried out a serological survey on a series of patients admitted during the year 1935. The types of individuals examined and the technique employed was the same as outlined in our report (1936) on the frequency and concentration of agglutinins for the enteric group of organisms.

We have already shown that this bacillus is markedly heterogenous serologically so that we had difficulty in selecting our test strain. Owing to the limited supply of the serum it was not possible for us to include more than one strain

in our test. We selected a strain of *Bact. pseudo-carolinus* which had been isolated from the stools of a patient suffering from dysentery. This particular strain has been studied carefully and is known as our 'standard strain' of *pseudo-carolinus*. It is a smooth strain and has not varied appreciably in its sensitiveness to agglutination. Antigenically it shows no serological relationship to any other strains of *Bact. pseudo-carolinus*. This fact must be kept in mind in the interpretation of our results.

Thick suspensions were made and diluted before use. The serum suspension mixtures were kept in the water bath at 52°C. The readings were made after 18 hours with the help of artificial light against a black background and the agglutination was read to the limit of visibility, with the aid of a hand lens. Only clear cut definite results were recorded. Adequate controls were maintained throughout.

Each serum was put up in five dilutions from 1 in 25 to 1 in 400. The results are given in tabular form.

TABLE I

The number of individuals examined, the percentage of sera giving agglutination at specified titres or higher with *Bact. pseudo-carolinus*

Number of individuals examined	Number positive	TITRE				
		1 in 25 and over	1 in 50 and over	1 in 100 and over	1 in 200 and over	1 in 400
218	119	54.5	42.2	22.4	8.2	2.29

TABLE II

The percentage of sera in different age groups showing agglutinins for *Bact. pseudo-carolinus*

Age groups	Number of persons examined	Number showing agglutinins	Percentage positive in 1 in 25 and over
0-10 years	15	3	20.0
11-20 "	35	19	54.2
21-30 "	86	50	58.1
31-40 "	48	25	52.0
41-50 "	25	17	68.0
51 and over	9	5	55.5

A study of the results given in the tables shows that agglutinins for our standard *Bact. pseudo-carolinus* are frequent in the series of patients examined. In table I we see that 54 per cent of our series showed agglutinins at 1 in 25 or over and table II shows that after the first decade of life more than half of the individuals examined show the presence of agglutinins for this organism.

(Continued from previous page)

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TABLE III

The percentage of sera obtained from individuals suffering from various diseases giving agglutination in titres of 1 in 25 or over with *Bact. pseudo-carolinus*

Clinical conditions	Number of persons examined	Number showing agglutinins	Percentage positive in 1 in 25 and over
Kala-azar ..	7	0	0
Splenomegaly ..	16	5	31.2
Malaria ..	19	8	42.1
Dysentery ..	57	35	61.4
Miscellaneous febrile patients.	43	18	41.8
Miscellaneous afebrile patients.	76	53	69.5

TABLE IV

The percentage of sera obtained from individuals in the labouring and non-labouring classes giving agglutination in 1 in 25 or over with *Bact. pseudo-carolinus*

LABOURING CLASS		NON-LABOURING CLASS	
Number examined	Percentage positive	Number examined	Percentage positive
139	60.4	79	45.3

TABLE V

The percentage of sera obtained from males and females giving agglutination in titres of 1 in 25 or over with *Bact. pseudo-carolinus*

MALES		FEMALES	
Number examined	Percentage positive	Number examined	Percentage positive
187	49.2	31	54.8

Table III shows that the frequency is high in patients suffering from dysentery. In the seven patients suffering from kala-azar whose sera we examined we found no agglutinins for this organism. This observation is interesting and when similar negative results obtained with the enteric organism are considered, suggest the failure or blockage of the antibody-producing apparatus. The actual number of patients tested is however too small to justify any definite conclusions.

Table IV shows the percentage of sera obtained from individuals in labouring and non-labouring classes giving agglutination in 1 in 25 or over with *Bact. pseudo-carolinus*. A study of this table will show that the agglutinins

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GOLD THERAPY IN PULMONARY TUBERCULOSIS

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THE greatest achievement towards the modern treatment of pulmonary tuberculosis has been the surgical treatment, but the question of treatment and prevention does not stop there. It is a fact that tuberculosis is mainly a disease of the poor, who are improperly fed and live under insanitary conditions. The essential points in favour of the treatment remain a gospel to this day, viz, good food, fresh air, sunshine, proper rest, hygienic surroundings and climatic sanatoria.

Posters and advertisements for tuberculosis cures have bewildered people and are rather harmful in the sense that the patients, without consulting the nearest tuberculosis-helping centre, rest content with the false idea that they are getting the proper specifics in those patent drugs. They almost always realize their folly too late. No one should encourage the use of this type of drug, most of which contain a sedative of the morphine group for cough, they thereby alleviate the troublesome cough, creating confidence in the patient only to hasten his end quietly.

Sanatorium treatment is helpful in all cases in all stages as a support to any scientific treatment (surgical treatment) but this is usually out of reach of the majority of people as they are generally very poor.

In the treatment of pulmonary tuberculosis we cannot overlook the social status of the

(Continued from previous column)

are more frequent in individuals belonging to the lower ranks of society. This is what we found in the case of enteric agglutinins. There is no appreciable difference in the two sexes.

Summary.—The frequency and concentration of agglutinins for a standard strain of *Bact. pseudo-carolinus* in a series of 218 patients admitted into the Carmichael Hospital for Tropical Diseases, Calcutta, has been determined.

The inference that one can draw from the results of this survey is that infection by this organism is widespread in Calcutta. This is corroborated by the frequent finding of this organism in the routine examination of the stools.

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patient; indeed it should receive our first attention.

The treatment may be grouped as follows:—

TREATMENT OF PULMONARY TUBERCULOSIS

Preventive

Disposal of sputum.
Care on the part of the patient.
Isolation of contact subjects.
Care of the fomites (concurrent disinfection).
Terminal disinfection.
Mass education, etc.

Curative

Surgical

Artificial pneumothorax.
Phrenic evulsion and alcoholization of the phrenic nerve.
Thoracoplasty.
Compressive oleothorax.
Apicolysis.

Medical

Sanatorium treatment (the best of all).
Calcium therapy.
Tuberculin therapy.
Gold therapy.

Sanatorium treatment is by far the best treatment to deal with the disease. The object is to place before the tuberculous patient all the best ideas of an institutional treatment, which will not only guide him but also his neighbours towards the treatment and prevention of tuberculosis. Though this is by far the best treatment by itself or along with others, its chief drawback is that it is very expensive and not within the easy reach of the poor classes. In our country there are only a few climatic sanatoria with a limited number of beds. The climate of most places in India being unsuitable for the purpose and a large amount of capital expenditure being necessary, India will have to look to the future with vague hopes when cheap climatic sanatoria will be within her easy reach. In considering ideal sanatoria, the climate, humidity, velocity of the wind, altitude and barometric pressure, and ranges of temperature must receive proper attention.

Gold, if judiciously administered, is certainly of great value in the treatment of pulmonary tuberculosis. The nature of its action has been differently interpreted by different authorities; some describe it as having an action allied to non-specific protein therapy. It acts most probably by stimulating the cells of the reticulo-endothelial system.

Gold should never be considered as a specific for tuberculosis. The idea that gold sterilizes the sputum is probably wrong. The nature of the effect produced is that it tends to localize the lesions which become more productive in nature, i.e., it tends to produce more fibrosis and calcification. Early infiltrations tend to disappear, but as the chronic productive lesions are not well supplied with blood vessels the action

of gold in these cases is negligible—whereas in subjects with severe general reactions, such as a high temperature, it is not suitable. When there are other parts affected besides the lung, such as the larynx or the abdominal glands, gold is not, however, contra-indicated. In administering gold the following additional points must be borne in mind:

It should be given once a week, if not contra-indicated.

The doses should be graduated, and before going on to the next higher dose it must be seen that the last was well tolerated; a small initial test dose may be helpful.

The patient must observe full rest before, during and after the injection.

The urine should be examined for albumin before and after each gold injection.

A careful watch must be kept on the pulse, respiration and temperature of the patient, and the body reactions noted.

The dangers

Dyspnoea and cyanosis immediately after the injection.—In such a case the patient should be put to bed under the fan, a stimulant mixture should be given by mouth, the face should be sponged with cold water, and a subcutaneous injection of 0.5 c.cm. of adrenalin chloride, 1 in 1,000, should be given at once.

Hæmoptysis.—In such a case gold therapy should be suspended for the time being and calcium should be administered—and, if the hæmorrhage persists, the preparation may be changed and in obstinate cases given up altogether.

General febrile reactions.—In such a case the dose should be diminished and the interval between injections should be prolonged, and calcium therapy will help.

Appearance of albumin in the urine.—In this case suspend gold therapy, give alkalies and diuretics; then later give the gold in diminished doses, prolong the interval, and, if necessary, turn to another preparation.

Rash all over the body.—This is sometimes very irritating. Give adrenalin $\frac{1}{2}$ c.cm. hypodermically every morning till the rash disappears, and calcium by mouth, suspend the injection for one week and repeat the previous dose.

Gold preparations.—Sanocrysin and crisalbine are in my experience the best, but they are expensive, they have to be given intravenously, and the reactions are frequent. This requires skill on the part of the doctor.

Solganol B. Oleosum is an efficient and popular preparation, but it is also expensive and moreover one has to work up to the full dose gradually, which means several injections.

Oleo-sanocrysin deserves mention along with other preparations. It is a good preparation and comparatively less costly than the others; though a long course is required it is used by many with good results.

Recently, I have used a preparation myocrisin in oil (May and Baker) which I found very useful. It possesses the advantages over the other gold preparations in being equally efficient, requiring a very short course (weekly injections of 0.02 grm., 0.05 grm., 0.1 grm., 0.1 grm., 0.1 grm., and 0.1 grm.) covering only six weeks, being comparatively cheap, being very well tolerated (I have used it mostly in cases which seemed to tolerate other gold preparations very badly), and causing little if any reaction.

The criterion of improvement with gold therapy should be the following:—gain in weight, return to normal of the pulse and respiration, temperature remaining normal, abatement of the symptoms, decrease in the sedimentation rate of the blood, and other prognostic indices, such as the Schilling leucocyte count coming down to normal, an increase in vital capacity, x-ray findings showing a more productive type of lesion and tendency to calcification, and the disappearance of moist sounds on auscultation.

Myocrisin in particular, as well as the other gold preparations mentioned above, satisfy these conditions more or less.

Case notes

Case 1.—Patient, A. S., age 30, male. First seen on 19th November, 1934.

Weight—7 stone 12 pounds. Pulse—79 per minute. Cough—1 year. Expectoration—scanty. Hæmoptysis—profuse, ten times during one year. Marked wasting. Pain—right back. Sputum—negative.

X-rayed on 19th November (figure 1a)—scattered semi-soft infiltration, right upper and middle zones, fibrosis and chronic foci at places.

Surgical treatment refused. 'Koloid gold' resulted in high reactionary temperature.

Solganol B. Oleosum.—After two injections a big hæmoptysis, lessened by calcium.

X-rayed again on 2nd January, 1935 (figure 1b)—semi-soft infiltration right, showed calcification in places.

Weight—8 stone 2 pounds. Pulse—80 per minute.

Oleo-sanocrisin tried next.

Patient seemed to tolerate gold preparations very badly as the injection was followed by 100°F. temperature for three days, hæmoptysis and more cough so sanatorium measures adopted. Calcium and cod-liver oil given by mouth.

X-rayed on 1st March (figure 1c)—more fibrosis and calcification.

The temptation to give another course of gold therapy was irresistible.

Myocrisin in oil was given on 30th March. Six weekly injections of 0.02 grm., 0.05 grm., 0.1 grm., 0.1 grm., 0.1 grm., and 0.1 grm. No reaction, no temperature, no hæmoptysis. Urine free from albumin.

Pulse 70 per minute throughout. General condition improved. Weight—8 stone 6 pounds.

X-rayed again on 9th August (figure 1d). Right side foci showed dense calcification and some calcified spots with tenting of the right diaphragm, some bronchiectatic changes on the left base.

Due to carelessness he had an attack of hæmoptysis on 14th June which was treated by calcium. One month ago he finished his second course of myocrisin and is keeping better; improved in weight and health. Sedimentation test almost normal.

Case 2.—S. K. D., age 24, male. First seen on 7th April, 1934. Cough—2 years. Frequent hæmoptysis last year. Temperature normal. Pulse—110 per minute. Wasting. Weight—7 stone 4 pounds. Sputum

—negative. X-ray (figure 2a) showed infiltration right upper and middle zones with areas of breaking down, early infiltration left upper zone.

Artificial pneumothorax done for right lung together with gold therapy.

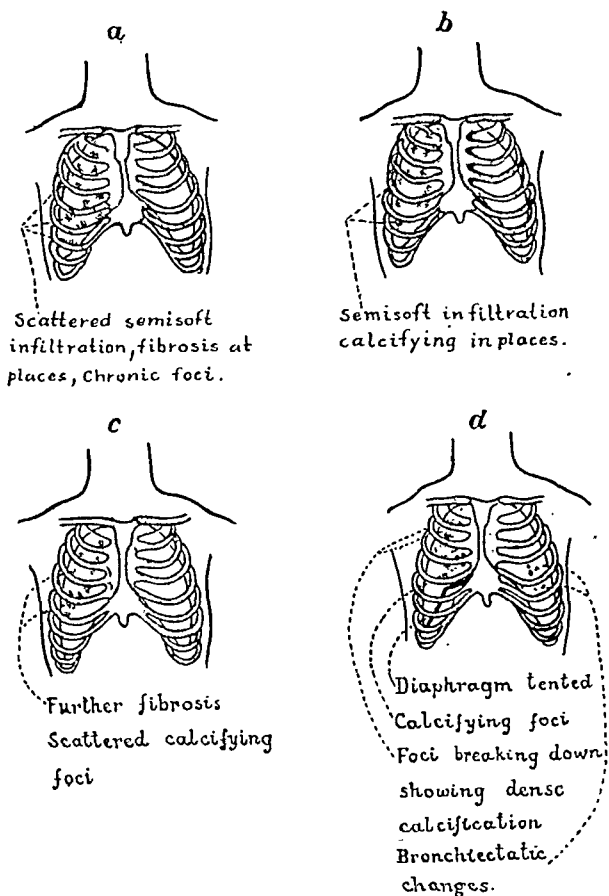
Solganol B.—Four doses of the first preparation were given consisting of one-half and three full doses, and four full doses were given of the second preparation.

Patient showed increase of pulse rate.

Myocrisin started on 10th July, 1934. Course completed on 15th August and patient x-rayed on 24th August (figure 2b). Right side partial collapse with two bands of adhesions in the upper zone. The three foci showed marked fibrosis, there was a little fluid at the base. Calcified spots left subapical.

Artificial pneumothorax continued and another plate taken on 16th April, 1935 (figure 2c). Hard infiltration

Fig. 1.



with dense fibrosis right upper zone with partial collapse. Hard, early infiltration with fibrosis left subapical. Artificial pneumothorax abandoned later and x-rayed again on 3rd June: old focus, showing hard infiltration with more fibrosis right upper zone. Deflection of trachea to right. Old basal pleurisy right, very hard infiltration with healing left subapical.

Condition of patient at present.—Temperature normal. Pulse—90 to 92 per minute. Weight—8 stone 2 pounds. No complaints.

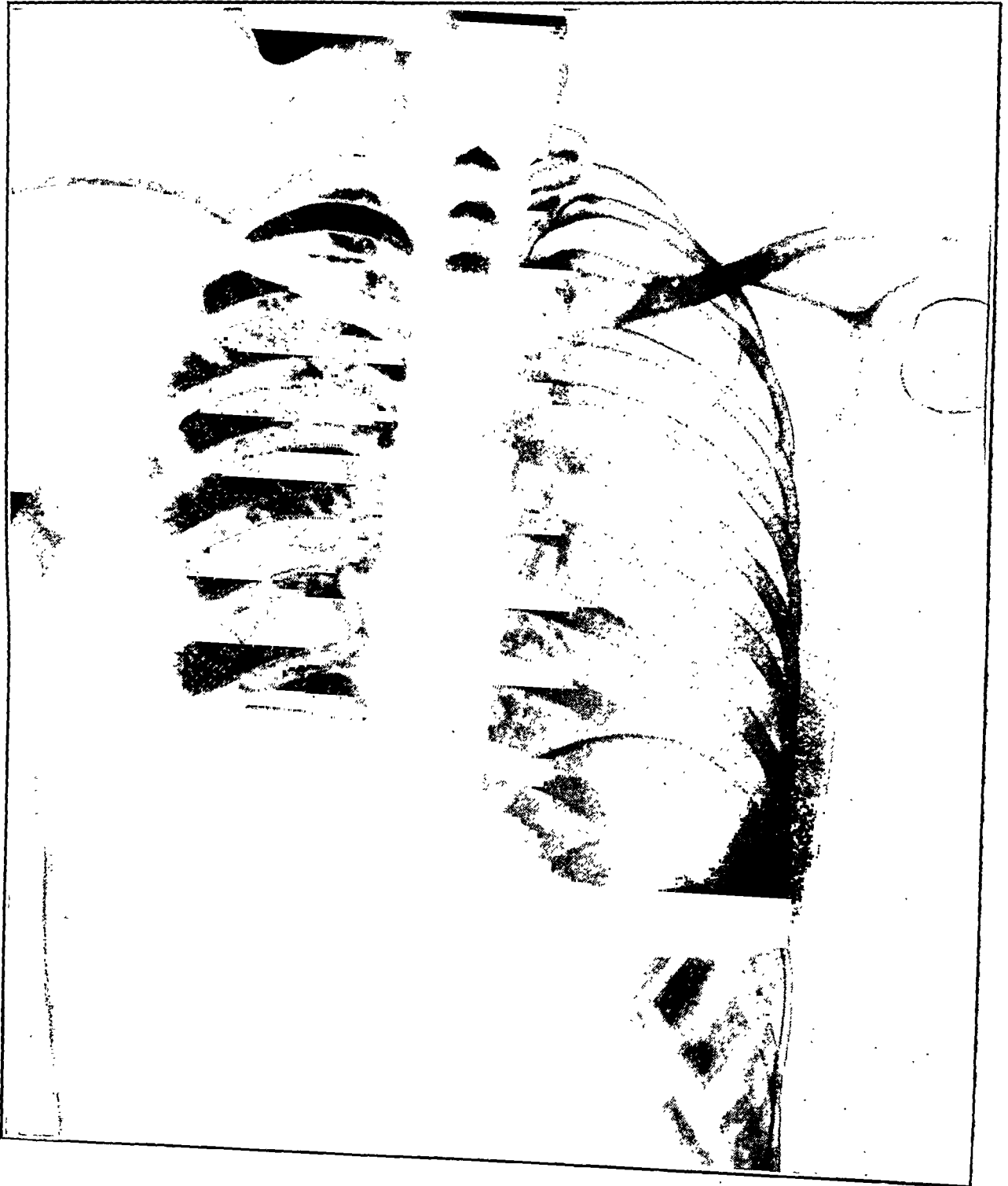
Second course of myocrisin finished recently. Patient with no complaints. Last x-ray on 3rd June, 1935 (figure 2d).

Case 3.—A. S., male, age 50.

Weight—7 stone 6 pounds. Complaints of cough for 10 years. Scanty expectoration. Hæmoptysis repeated and profuse, two years. Wasting marked. Palpitation. Dyspnoea with cough and asthma.

On examination.—Râles and rhonchi all over the chest. Signs of cavity right upper lobe.

PLATE II
Mrs. L. S. 15-7-35



X-ray on 6th November, 1934. Infiltration with partial fibrosis (azygos lobe), small patches of scattered foci seen in both upper lobes (figure 3a).

Sputum—negative.

Koloid gold produced high reactionary temperature.

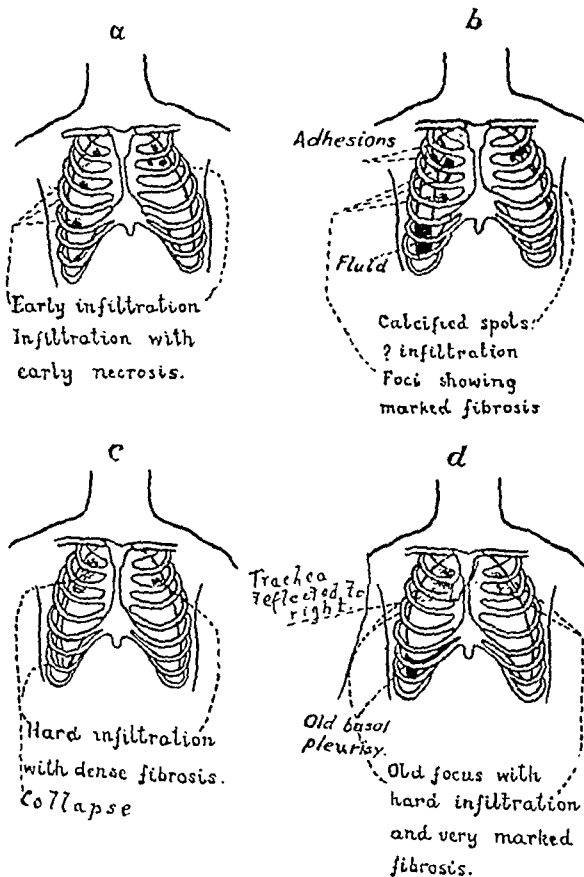
Solganol B. Oleosum.—Two injections of the first dose (half and full) followed by severe hæmoptysis, treated by calcium.

4th December, 1934.—No hæmoptysis, alarming dyspnoea, condition low.

X-rayed on 2nd January, 1935 (figure 3b). Soft infiltration of both upper and middle zones with a big cavity at the right upper lobe.

Oleo-sanoecrysin started on 6th January, 1935. After three injections of 2 c.cm. of a 5 per cent solution another attack of dyspnoea on 25th January and a big hæmoptysis on 26th treated by calcium. Oleo-sanoecrysin resumed from 3rd February (3 c.cm. of 5 per cent). Same trouble again.

Fig. 2.



Patient x-rayed again on 2nd March (figure 3c), showing patches of infiltration of both upper and middle zones with some fibrosis around the cavity.

Myocrisin was started from 7th June, 1935, and the course was completed on 11th July and the patient was x-rayed, showing hard foci with dense fibrosis in both upper zones (figure 3d). Thick-walled cavity right upper lobe.

Present condition.—Weight—8 stone. Cough very slight. Other symptoms less.

Case 4.—D. L. M., male, age 36. First seen on 23rd February, 1935.

Complaints of dry cough for three years. Marked progressive wasting. Pain middle of left chest. Headache and anorexia. Constipation. Malaise in the evening.

Gums—pyorrhoeic. Tonsils—enlarged, not septic. Chronic generalized pharyngitis. Urine—albumin, a trace (disappeared after twenty days of treatment).

Sputum—negative. Weight—8 stone 2 pounds. X-rayed on 2nd April, 1935. Hard focus, old and healing right subapical (figure 4).

Auscultation—no moist sounds, harsh breath sounds, right subapical.

With other treatment for the throat and gums patient was advised sanatorium measures but he was rather obstinate.

Myocrisin started on 5th April and completed on 16th May.

Fig. 3.

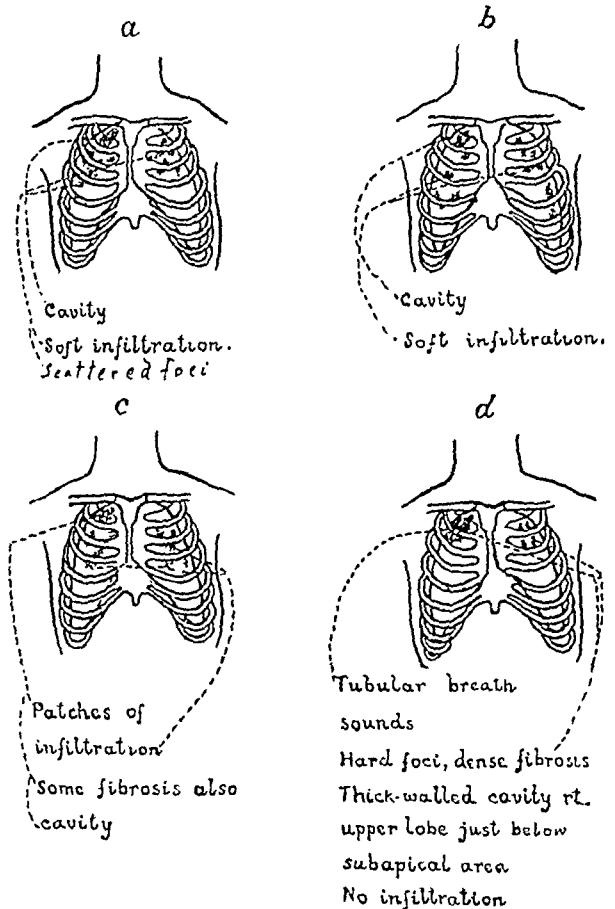
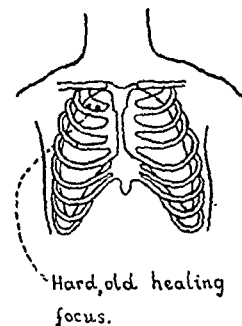


Fig. 4.



Condition on 20th May, 1935.—Weight—8 stone 5 pounds. General condition much improved. No malaise. Appetite good.

Case 5.—L. S., female, age 18, married. First seen on 4th April, 1935.

Complaints of cough for six months. Scanty expectoration. Hæmoptysis profuse one month ago and repeated after the patient was brought down from Delhi a few days ago. Sputum—strongly positive for acid-fast bacilli (8 to the field).

Screen examination showed soft patchy infiltration of upper three-quarters of right lung and extensive soft infiltration with multiple cavitations of left lung. Wasting marked.

It was not possible to take the weight.

X-ray thought unnecessary as no active surgical help could possibly be rendered.

Temperature—98.4°F. in the morning. 100.4° to 100.6°F. in the evening. Frequent loose motions. Voice hoarse (laryngoscopy showed both vocal cords ulcerated). Morning vomiting.

Patient three months' pregnant but termination of pregnancy definitely refused. On auscultation, signs of multiple cavitation of left lung, and fine moist râles almost all over the upper three-quarters of the right chest. Sanatorium measures adopted along with treatment for other conditions till the temperature came down to 98.4° and 99.4°F.

Gold therapy started from 24th April, myocrisin 0.1 gramme given once a week for four doses.

On 18th May there was hæmoptysis of four ounces. Gold therapy suspended.

From 20th May, fever nil, vomiting and cough persisted.

25th May—another injection of 0.1 gramme was given but was followed by an alarming hæmoptysis which was treated by calcium. Sanatorium measures continued, and on auscultation moist sounds were absent in the right lung.

X-ray was taken on 15th July. The condition was as follows:—

Pulse respiration—100/22. No fever. Cough less. Vomiting less. Voice better. No sputum. Pregnancy seven months.

Plate II. On x-ray multiple cavities left upper zone tending to fibrosis, slight retraction of the heart to left, extensive infiltration left lower zone, semi-productive infiltration scattered all over the upper half of the right lung.

Judicious administrations of artificial pneumothorax on left side with gold therapy advised. Artificial pneumothorax is still being carried on.

Another series of myocrisin started on 4th August and 0.1 gramme of each was given weekly and was completed on 4th September.

Plate III. An x-ray was taken on 31st August, showing partial collapse with still patent cavities, left lung with more fibrosis of the infiltration. Infiltration mostly clearer with a small area of hard infiltration on the upper zone on the right side.

On 6th September, the patient was delivered rather suddenly of a healthy full-term boy. Perineal stitches were needed. Slight temperature started again from 8th September with loose motions, both of which gradually passed off.

Gold therapy again resumed on 15th October in the following way:—

Weekly injections of 0.1 grm., 0.2 grm., 0.2 grm., 0.3 grm., 0.3 grm., and 0.3 grm. were given, the last dose was followed by slight discomfort so 0.2 grm. was given for the last three doses.

Plate IV. Last x-ray was taken on 3rd January, 1936, showing partial collapse of the left lung with complete obliteration of the cavities and a small calcified area in the right subapical portion.

Points of interest:—

- (1) Patient semi-rural with little immunity.
- (2) Lesion not productive, it was a bilateral advanced case.
- (3) Sputum positive.
- (4) Patient weak, emaciated and pregnant and was delivered in the course of the treatment (the baby has been separated).
- (5) There was laryngeal affection and probably intestinal affection also.
- (6) Gold therapy was interrupted by hæmoptysis.
- (7) Artificial pneumotherapy was difficult to perform because of adhesions.
- (8) Sanatorium treatment was not available.

(Continued at foot of next column)

EXAMINATION OF SEMINAL STAINS IN MEDICO-LEGAL CASES

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EXAMINATION of seminal stains is an important part of medico-legal work in India.

Under the tropical conditions of this country, the filaments of spermatozoa often break on the clothing and are separated from their respective heads. The only positive and trustworthy test for semen has hitherto been regarded as the detection of spermatozoa, one or more being seen with at least part of the filament attached, for the reason that many other foreign bodies may simulate the heads of spermatozoa.

In a hot dry climate the usual practice of detecting spermatozoa is to follow Dr. Hankin's method (*see Lyon's Medical Jurisprudence for India*, page 225, Eighth Edition). The films obtained on the slide by this method are finally stained with carbol fuchsin.

The *débris*, consisting of fibre scrapings obtained from the cuttings of the suspected stains on fabrics and inorganic dirt, are also deeply stained with fuchsin, with the result that in most cases the spermatozoa remaining under the *débris* may not be detected with certainty. Unless a good specimen is seen in a clear space, the slide with much foreign matter has the chance of being declared negative, when it is really positive. On the other hand, round or oval, dyed foreign matter with a dyed tail-like fibre or the edge of an inorganic mass becoming attached to the former, may be imagined as a spermatozoon and wrongly the slide may be declared positive.

Investigations were, therefore, undertaken to discover methods of dissolving out the dye taken up by foreign matter without affecting that taken up by the spermatozoa, but without success. Hence it was thought that if much of the foreign matter itself, if not all, could be removed without disturbing the spermatozoa, considerable advantage might be obtained in the examination of the films.

Experiments were then made by washing out the films on slides obtained from stains on clothes with strong sulphuric acid (specific gravity 1.84). It was found that the acid had no effect on spermatozoa when fixed on slides, while it readily dissolved out fibrous and other foreign organic matter such as yeast cells, which may simulate the heads of spermatozoa, and at the same time it loosened much of the inorganic dirt sticking to the organic matter.

(Continued from previous column)

Present condition.—Pulse and respiration down to normal. Voice no longer hoarse. Laryngeal ulcers healed. Temperature normal. Patient gaining weight. The lesion has become productive. No cough, no symptoms. Twenty-four hours' collection of sputum showed no acid-fast bacilli by the concentration method. The sedimentation rate and the Schilling count are almost normal. In short, the disease may be considered to be making steady progress towards arrest.

Investigations were also made in the dyeing of spermatozoa. It was found that if the slides, after treatment with sulphuric acid, were stained with erythrosin and malachite green (other recognized double stains being found not quite suitable), instead of carbol fuchsin in the manner described below, the heads were stained beautifully red or pink, while the tails remained either green or blue. Whatever foreign mass still remained was either undyed or had usually a light green colour. By this method spermatozoa, magnified nearly 360 times, could easily be recognized with the help of a dry lens, thus making it for the most part unnecessary to use the oil immersion lens. The slides so prepared could be examined not only with greater ease and speed, but also with much greater certainty and accuracy. Spermatozoa even lying under inorganic matter took up the stain and were clearly visible, while the heads, without any trace of filaments, took up the characteristic stain in such a way that they could be unmistakably recognized and declared as heads of spermatozoa.

Procedure.—The following solutions and chemicals are required:—

(a) Aqueous solution containing 0.5 per cent tannic acid and 0.2 per cent sulphuric acid.

(b) 5.0 per cent aqueous borax solution.

(c) Aqueous solution containing 10.0 c.cm. of bidistilled glycerine and 5.0 grammes of potassium alum per 100.0 c.cm.

(d) 2.0 grammes of erythrosin (Merck) dissolved in 10.0 c.cm. of rectified spirit. The solution is then made up to 100.0 c.cm. with 5.0 per cent aqueous carbolic acid solution.

(e) 0.5 gramme of malachite green (Merck) dissolved in 5.0 c.cm. rectified spirit. The solution is then made up with distilled water to 100.0 c.cm.

(f) 50.0 per cent alcohol.

(g) Strong sulphuric acid (sp. gr. 1.84).

(h) Glacial acetic acid.

The following is the technique for preparing the slides:—

(1) Add sufficient tannic-sulphuric acid solution to cover the cuttings of suspected stains, in a clean labelled test tube, and place the test tube in a beaker of boiling water for five minutes.

Much of the extraneous albuminous matter is removed by this process.

(2) Take out the cuttings and remove the superfluous liquid by pressing gently against pieces of filter paper. Then place the cuttings in a basin containing the borax solution, for three minutes.

(3) Take out and put the cuttings in another basin and wash twice or thrice with distilled water.

(4) Now place each cutting separately on a slide and holding it with forceps, scrape both the surfaces gently with a knife. If needed, a little water may be added, so that the scrapings may be spread over the major part of the surface of the slide.

(5) After drying, the slide should be passed rapidly over a Bunsen flame three times.

(6) When the slide is cool, add five to ten drops of strong sulphuric acid, and spread it over the slide gently with a glass rod. This may be done by keeping the slide on a porcelain tray.

(7) Hold the slide lengthwise at one end and let the acid act on the film by gently tilting the slide up and down. After two or three minutes the slide should be washed in running water, avoiding direct splashing of the water on the slide.

(8) Spread a few drops of glycerine-alum solution on the slide and leave for three minutes.

(9) Wash thoroughly with distilled water, jerk off the draining water and stain with erythrosin solution by spreading a few drops over the slide.

(10) Dry, if necessary, by placing the slide on the top of a water-bath or a hot-air oven. Wash with distilled water and then stain again by spreading a few drops of malachite green solution.

(11) Wash out after 15 seconds successively with water, 50 per cent alcohol, a few drops of glacial acetic acid and water again. Stain with malachite green solution again and wash immediately with water.

(12) The slide should next be dried by gently pressing a piece of filter paper over it and it is then examined under a microscope.

When direct smears of suspected semen are received, spermatozoa, which may be present, should first be fixed by passing the slide three times over a Bunsen flame. Some tannic-sulphuric acid solution, after boiling in a test tube, should then be poured over the slide. After five minutes the slide should be washed, dried, and then all the processes noted above from 6 onwards should be employed. It is then ready for examination under the microscope.

My thanks are due to Mr. D. N. Chatterji, F.I.C., Chemical Examiner to Governments, U. P. and C. P., for encouragement and suggestions which I have received from him in carrying out the above investigation, and also for his permission to publish this paper.

A Mirror of Hospital Practice

ARSENICAL INTOLERANCE OVERCOME BY DESENSITIZATION

By R. N. CHAUDHURI, M.B. (Cal.)

Officiating Assistant Professor of Tropical Medicine, School of Tropical Medicine, Calcutta

VERY little is yet known of the cause of arsenical intolerance. At present all that can be said is that it is due to personal idiosyncrasy. Unless premonitory signs are ignored, it reflects no discredit on the doctor giving the treatment, and is more or less independent of the dose of arsenic. It has no connection with the syphilitic infection; at least, this view is not seriously considered.

One of the bugbears of arsenobenzene treatment is the risk of the patients developing exfoliative dermatitis, from which they may die, or be incapacitated for a variable period. Further, in patients who have shown signs of skin sensitiveness in this way, however mild, the resumption of arsenical injection, even after a long interval, is always a matter of great anxiety, with the result that in most cases none is given.

In such cases of manifest intolerance to arsphenamine, one naturally seeks a remedy which will not deprive the patient of the benefits of antisyphilitic treatment. Mercury and bismuth preparations, while valuable adjuncts, are not real substitutes for arsphenamine. A change from one compound to a different

preparation of the series will sometimes solve the problem, but not always. It has been noticed that in some patients an untoward reaction developed when treatment was resumed with a different arsphenamine.

D. B., male, aged 23 years, was sent to the Carmichael Hospital for Tropical Diseases as a suspected case of typhus fever on the 3rd September, 1935. He complained of high fever without remission for about a week and a rash practically all over the body for four days.

History of the case revealed that he had a primary sore four months ago, which was not properly treated but healed up spontaneously. Three months later his wife developed secondary eruptions and her Wassermann reaction was strongly positive. While she was being given antisyphilitic treatment, the attending physician advised the same for the man. Accordingly he was given two injections of neosalvarsan. The first dose (0.3 gm.) was given on 23rd August, 1935, and the second (0.45 gm.) on 27th August. He had some fever after the first injection and, after the second one, the temperature went up very high. After that it remained high continuously. On the 30th August he also developed a rash on the body.

At the time of admission his temperature was 105.2°F., pulse 120 and respiration 38 per minute. There was an erythematous rash with slight desquamation practically all over the body. It was most marked on the face and upper part of chest and was slightly irritable. His state of nutrition was good. With the exception of a palpable spleen and pyorrhœa alveolaris, no other abnormality was detected on physical examination. There was nothing particular in the past history other than a few attacks of malaria.

With symptomatic treatment only, all the symptoms completely subsided within three days after admission and the patient was discharged on the 9th September. The provisional diagnosis of typhus was changed to dengue in view of the patient's rapid recovery and good general condition, but the possibility of the rash being caused by the arsenic injections was considered.

On the 10th September he was given another injection of neosalvarsan, 0.3 gm. intravenously, by his attending physician. This was also followed by another reaction, consisting of high fever and an erythematous rash. He was re-admitted into the hospital on 11th September. All the symptoms subsided within a couple of days.

Laboratory findings:—

Blood—

- Malarial parasites—none found.
- Microfilaria—none found.
- Bacterial culture—sterile.
- Widal—negative.
- Weil-Felix reaction—negative.
- Wassermann reaction—strongly positive.
- Van den Bergh test—direct—negative; indirect—slightly positive.

Lævulose tolerance test—

- Before lævulose—0.070 per cent.
- $\frac{3}{4}$ hour after—0.095 per cent.
- $1\frac{1}{2}$ hours after—0.095 per cent.
- $2\frac{1}{2}$ hours after—0.080 per cent.

Urine—

- No abnormality detected excepting a slight excess of urobilin.

Stool—

- Protozoa—scanty Giardia cysts.
- Ova—scanty hookworm ova.
- Bacteria—no pathogenic organisms isolated.

The question of finding a suitable antisyphilitic treatment for this patient was considered during the second time of his admission. It was decided to try the method of desensitization. Accordingly he was first injected with minute doses of sulfarsenol intramuscularly and then the doses were gradually increased

and administered alternately with intramuscular injections of hypoloid bismuth as shown in the following table:—

No.	Date	Drug	Dose
1	25-9-35	Sulfarsenol	1 mgm.
2	26-9-35	"	10 "
3	27-9-35	"	40 "
4	28-9-35	"	6 ctgm.
5	1-10-35	Bismuth	1 c.cm.
6	3-10-35	Sulfarsenol	6 ctgm.
7	8-10-35	Bismuth	1 c.cm.
8	10-10-35	Sulfarsenol	6 ctgm.
9	15-10-35	Bismuth	1 c.cm.
10	18-10-35	Sulfarsenol	12 ctgm.
11	22-10-35	Bismuth	1 c.cm.
12	25-10-35	Sulfarsenol	18 ctgm.
13	29-10-35	Bismuth	1 c.cm.
14	1-11-35	Sulfarsenol	24 ctgm.

(The patient was discharged on 2nd November, 1935, and the following injections were given in the out-patients' department.)

15	5-11-35	Bismuth	1 c.cm.
16	8-11-35	Sulfarsenol	30 ctgm.
17	13-11-35	Bismuth	1 c.cm.
18	15-11-35	Sulfarsenol	36 ctgm.
19	19-11-35	Bismuth	1 c.cm.
20	23-11-35	Sulfarsenol	42 ctgm.
21	27-11-35	Bismuth	1 c.cm.
22	10-12-35	Sulfarsenol	48 ctgm.

The patient tolerated the above injections very well and is still under treatment and observation.

The case illustrates certain points of importance in arsenical hypersensitiveness. In every case, whatever the signs may be, these should be seriously considered before the next injection is given. Investigation of this case showed slightly defective liver function; but it is difficult to say how far this was the cause of the reactions. Desensitization with minute doses of different preparations of the series repeated at frequent intervals proved effective in this case and this method is worth trial in every instance of manifest intolerance to arsphenamine.

My thanks are due to Dr. L. E. Napier, M.R.C.P. (Lond.), under whose care this patient was treated, for his permission to publish these notes.

A CASE OF SCORPION BITE

By A. C. DEY, L.M.F. (Cal.)

Senior Resident Medical Officer, Astanga Ayurveda Medical College Hospital, Calcutta

A FEMALE, aged 11 years, was admitted into the Astanga Ayurveda Hospital on 1st May, 1935, for treatment of a scorpion bite.

The history given by the mother was that, while the girl was playing, she was stung by a black scorpion on the upper part of her left nipple and on the chin. After about an hour the child became restless and began complaining of a burning sensation at the sites of the bites, froth came out of her mouth and she began perspiring profusely. Getting alarmed at the condition, the mother brought her to the hospital for treatment.

Condition on admission.—The patient was in an extreme state of shock. Pulse and respiration rate 145/32

per minute, temperature 96°F. The heart sounds were feeble. The tongue was dry and the patient was extremely restless. The eyes were congested, with widely dilated pupils. The bites revealed no abnormality except slight œdema surrounding the sting.

The patient was treated for shock and cardiac stimulants were freely given. That evening the condition was much improved. The volume and tension of the pulse increased and the rate diminished. The child slept fairly well that night. Next morning the patient looked well and the same treatment was continued, but she gradually became restless and began to vomit blood from 10 a.m. and passed a stool which contained altered blood. The rate of respiration increased to 45 per minute and of the pulse to 160 per minute. All the signs of internal hæmorrhage were present and in spite of all treatment the child died at 11-15 a.m. the same morning.

Special points to note in this case are:—

(1) Scorpion bite, though a common occurrence in India, rarely ends fatally.

(2) The child apparently recovered from the effects of the poison in the beginning only to succumb after an interval of about 14 hours from internal hæmorrhage, signs of which were not evident in the beginning.

(3) The signs and symptoms present in this case simulated those caused by viper venom.

[Note.—(Kindly contributed by Bt.-Col. R. N. Chopra, C.I.E., I.M.S.). Scorpions never sting man unless disturbed and their stings are rarely fatal although there are other cases on record of young children or debilitated persons being killed. The maximum amount of venom present in the glands of *Buthus* sp. has been estimated to be 5.2 mgm. Scorpion venom consists of the following active principles: (1) neurotoxin, acting on the respiratory and vasomotor centres, nerve terminals and end-plates of both striped and unstriped muscles and (2) hæmolysins, agglutinins, hæmorrhagins, leucoctolysin, coagulins, ferments, lecithin and cholesterolin.

The usual symptoms of scorpion sting are intense burning pain radiating from the site. This is followed by weak pulse, rapid respiration, convulsions, mental disturbances, hallucinations, marked salivation and lachrymation and profuse sweating and polyuria; abortion may occur in pregnant women. The nervous system becomes highly irritable, reflexes are increased; tremors, muscular twitchings and spasmodic movements followed by paresis or paralysis of individual muscles may occur. There may be motor paralysis, nystagmus and blindness.

The venom in the scorpion is not only used as a means of defence, but also to kill its prey. It is only toxic when injected subcutaneously or intravenously and has no ill effects if taken by the mouth. Scorpion venom resembles snake venom in action. The venom paralyses the nervous system and death in animals is due to the curare-like action on the nerve end-plates especially of the muscles of the respiratory system. It produces coagulation of the blood, hæmorrhages from injury of the capillary walls and it leads to formation of emboli from agglutination of the red blood corpuscles. It increases the lachrymal, nasal, salivary, laryngeal and tracheal secretions on account of its action on the vagal and spinal centres. On the intestines it acts like pilocarpine and thus by increasing peristalsis it produces vomiting and purging. The venom is no more dangerous than bee or wasp venom.

The treatment for scorpion sting is the same as for snake bite. A proximal ligature, incision of the wound and sucking out of the venom and application of potassium permanganate are useful. If possible immediate injection of immune horse serum will be found very valuable. Washing and bathing of the part with weak solution of ammonia or borax, and local injection of colloidal manganese may be tried. Subcutaneous injection around the site of the wound of 5 to 10 minims of a 5 per cent solution of cocaine in adults and 1 to 5 minims in children help in relieving the pain. Eucaïn and stovaine may be conveniently substituted. Tyrosin

and the juice of dahlia are said to have a neutralizing action on the venom. Local injections of 1 per cent solution of tutocain in 2 c.cm. doses, given subcutaneously, appear to be a good remedy.

No antivenene for scorpion venom is prepared in India as the sting is rarely fatal. However, cobra and daboia antivenene, prepared at Kasauli, imparts a certain amount of protection in rabbits and dogs which have received a lethal dose of the venom of *Buthus tumulus* and *Palamanus swammerdami*. None of the Indian plant remedies popularly used for scorpion sting has been found to have any preventive, antidotal, or therapeutic effect against scorpion venom.—Editor, I. M. G.]

A CASE OF CEREBRAL MALARIA CAUSING PERSISTENT LOSS OF EYESIGHT

By A. K. GHOSE, L.M.F., L.T.M.

Medical Officer, Ambari Tea Estates, Carron P. O., Jalpaiguri

The following case is reported on account of its rarity:—

On 3rd November, 1935, I was called at 2 p.m. to attend the patient, a coolie aged about 36 years, of very robust constitution, who had worked the whole of the previous day. On the morning of the day I saw him he had slight fever and at noon he passed two loose motions and suddenly became unconscious.

Condition on examination.—The patient was completely unconscious lying on his back. Temperature—100.8°F. Pulse—90 p.m. of good tension and volume. Respiration—slightly laboured with snoring sound. Spleen—slightly palpable beneath the costal arch. Pupils—greatly dilated and reflex absent. Conjunctiva—red and congested, reflex present.

Hands and legs stiff as if in tetanic contraction. The muscles of the neck also stiff. No sensation of pain present.

Diagnosis.—The case was diagnosed clinically as malaria of cerebral type.

Treatment.—At 3-30 p.m. 10 grains of quinine in 10 c.cm. normal saline were given intravenously. Rectal saline with glucose was also given. At 8-30 p.m. another 5 grains of quinine were given intramuscularly.

4th November.—Four thin blood films were taken in the morning for examination.

No appreciable change during the whole day. Quinine was given intramuscularly—10 grains in the morning and 10 grains in the evening. Temperature—98.6°F. in the evening.

5th November.—Another 20 grains of quinine were injected intramuscularly in two doses. At about 5 p.m. sensation of pain had returned as indicated at the time of injection. At night he developed symptoms of mania and tried to run away from his hut. The inmates of the house, being frightened, left him alone for the night.

6th November.—Twenty grains of quinine were administered intramuscularly in two doses. The man was now semi-conscious. He took a little glucose water, tea and gruel of rice.

Towards the evening he could speak a little but not distinctly. But he understood what we said.

7th November.—Quinine 20 grains with brandy and alkaline mixture were given orally daily and continued for 4 days. Now he asked for food and took some rice but complained of total loss of eyesight. Speech was not distinct. Pupils—still dilated, not reaching to light. Conjunctiva rather hazy.

He liked to lie with his eyes closed as if in deep sleep and did not like to be disturbed.

9th November.—Could speak distinctly but loss of sight persisted. Conjunctiva almost clear but pupils dilated.

13th November.—Pupils became normal, reacting to light, he could see a little but everything looked smoky to him; he did not recognize different articles held

before his eyes. Gradually within a fortnight he regained his eyesight but he still complains of some dimness of vision.

Blood report.—Though the films were taken on the second day after 15 grains of quinine was given they were full of rings of *P. falciparum*.

Interesting points :—

(1) Low temperature with grave symptoms.

(2) On the second day the temperature came down to normal but the patient did not regain his senses.

Discussion.—What was the cause of loss of eyesight in this case. Was it quinine amblyopia or malarial amblyopia?

Manson's *Tropical Diseases* says 'Malarial amblyopia is usually transient lasting for an hour or two only but sometimes it may be persistent and quinine amblyopia is the result of intense quinine poisoning after a dose of 80 to 160 grains, which may prove persistent and occasionally permanent'.

I wish to express my thanks to Dr. S. C. Sen Gupta for kindly examining the blood slides for me.

A CASE OF FIBRO-SARCOMA OF THE ORBIT

By A. C. DEY, L.M.F. (Cal.)

Senior Resident Medical Officer and Pathologist, Astanga Ayurveda Medical College Hospital, Calcutta

A MALE child, aged six months, was admitted in the eye ward of the Astanga Ayurveda Hospital on 13th August, 1935, for the treatment of sarcoma of both eyes.



Previous history.—The father of the child said that about a month ago the left eye suddenly became red with profuse watery discharge. At first he paid no attention to it, but as the congestion was increasing and the condition was becoming worse he consulted a local medical practitioner who gave some lotions and

eye drops without any benefit. Within a fortnight from the onset, the whole of the left eyeball had become prominent and both local (photophobia, lacrimation) and constitutional symptoms (fever, restlessness) increased.

Physical examination.—The general health of the child was fairly good. It would not allow the eye to be examined properly and was extremely restless. Axillary temperature—100°F. Pulse rate—145/30 per minute.

Local condition of the eyes.—The left eye—the lids, oedematous, dusky-red, veins engorged and clearly visible.

The eyeball was proptosed downwards and forwards, the upper eye lid covering the ball only its inner fourth. The episcleral veins were slightly more prominent than normal. The eye could be moved medially and laterally, and its upward movement was limited. Voluntary movement was slight and was specially noticeable on conjugate movement of the other eye. It was not possible to push the eyeball into the orbit. On palpation a hard mass with irregular surface was felt between the globe and the roof of the orbit along its whole length.

Cornea—dry, lustreless, and slight ciliary injection.

Anterior chamber—normal.

Pupil—semidilated and fixed.

Fundus—could not be seen on account of the loss of transparency of the cornea.

Pre-auricular and upper cervical glands—swollen, matted together and slightly tender. The skin over them was mobile.

The right eye—on admission appeared normal, but from the fourth day the following changes were noticeable:—

Slight oedema of the lid, proptosis downwards and forwards, veins slightly prominent. Upward movement slightly restricted.

Cornea, iris, pupil and lens—normal. Vitreous—slightly hazy.

Fundus—signs of papilloedema.

No other abnormalities were detected except slight enlargement of the liver and spleen.

A small piece of tissue was removed from the left eye by incision along the supra-orbital margin and was found to be a fibro-sarcoma. A Krönlein operation was suggested but was refused by the parents and so the child was taken away from the hospital.

TWO CASES OF ACCIDENTAL DATURA POISONING

By PHANI BHUSAN MUKERJEE, L.M.P.

Bahera, Darbhanga

In December last, I was called late in the evening to attend two children, aged about three and four years respectively, in a neighbouring village, for the treatment of their delirious condition.

History.—The people of the village collect datura fruits in the afternoon for the purpose of feeding their bullocks at night to keep off the cold in the winter. The children found the fruits and ate the interior portion with the seeds. The people thinking them to be possessed by some evil spirit consulted an exorcist but as he failed to do anything they sent for me.

Symptoms.—I found the children screaming with fright, restless, delirious, talking incoherently, crying loudly, trying to run away. Their pupils were widely dilated, pulse very quick, temperature a little raised and their abdomens distended.

Treatment.—I gave 20 grains of zinc sulphate to each to induce vomiting, and a mixture containing liq. morphine hydrochloride, sodium bicarbonate, magnesium sulphate, aromatic spirit of ammonia and tincture of digitalis.

The medicine produced the desired result and the children recovered completely.

Indian Medical Gazette

JULY

DIETARY AND NUTRITIONAL STANDARDS IN INDIA

THERE can be no question regarding the insistent cry that is heard to-day in India for an adequate or balanced diet and the desire to know more about diseases considered to be due to malnutrition. The problems, both direct and indirect, so raised are by no means simple. In the first place recommendation of a diet for all, considered adequate according to European standards, is not at present economically possible. In the second place the adoption of any one type of diet is incompatible with the numerous religious beliefs found in India.

So much for diet: what about diseases secondary to malnutrition? At the present moment recognition of the extent of nutritional disease depends largely on the critical acumen of the observer and ranges from a field embracing tuberculosis and the pyogenic infections on the one hand to a few well-recognized syndromes such as xerophthalmia, scurvy, beri-beri, etc., on the other. Apart from the gross signs of disease one might be entitled to ask what is to be the clinical criterion of a good or poor nutritional status. Recently we were asked for our opinion on some suggested improvements in the diet of seamen. In this particular case the points that appealed to us most forcibly were, firstly, the assumption that the diet was inadequate and, secondly, the conscious desire to emulate and simulate the European standard diet. The first assumption was plausible but, in this particular class of men, unproven at the time by any series of clinical observations. As regards the second point, the aim of emulating or simulating the European diet, one is justified in accepting the diet as ideal (and practical) for Europe, but there is no evidence that it would be the best or economically the most expedient for Indian seamen at the moment. In this respect one has to keep in mind the possibilities of what may be called relative food deficiencies. The requirement for blood-forming principles, apart from iron alone for instance, may be increased in areas where hookworm, malaria or other diseases affecting the blood are prevalent. There are also indications that the capacity to transform carotene into vitamin A in the human liver may be diminished in diseased states in which this organ is involved, as in kala-azar. Special supplements in such conditions might do much to improve the health as a practical expedient until the disease is considerably reduced or

eradicated. Clearly what is required in India is a detailed survey of diet, physique, food analysis and incidence of disease, before definite statements can be made about the precise rôle those factors play in the health of the community.

Recently a small diet survey has been carried out in children's institutions among the different communities in Calcutta which is suggestive in several respects. The diets in general, when compared to the British standard (Ministry of Health), contain only one-fifth of the quantity of animal protein, less than half the fat, and a third of the calcium intake recommended, as well as an almost entire absence of dairy products. In one particular community (Anglo-Indian) a comparison was made between the children of the different economic grades and some suggestive observations were made. The heights of the two groups showed little difference but the weights of the poorer class children were considerably below those of the better situated. Similarly the incidence of enlarged tonsils and carious teeth was higher in the first-mentioned group but no clear cut signs of any well known deficiency disease were noted. Such findings, however, as enlarged tonsils cannot be taken *a priori* as due to malnutrition alone; undoubtedly local hygienic conditions, housing, etc., may have contributed their part. The apparent absence of many signs of nutritional disease in the Calcutta area, even among Indians, is not however in agreement with findings in other parts of India. Such results undoubtedly demonstrate the necessity of a survey over the whole of urban and rural India. In this respect the scope of the rural practitioner for making clinical observations of the finer degrees of nutritional deficiency is unlimited. At the present time both the medical profession and the lay public implicitly assume that the science of nutrition is a laboratory one with rats as the 'acid test' of a complete diet. Clinical and laboratory experience indicate that the finer manifestations of malnutrition in the human subject are probably much more protean and varied than can ever be shown by any rodent in a cage. The range of climatic and other environmental conditions are so varied that, although they add to the complexity of the problem, the information so obtained is capable of direct application to man himself. Some years ago Sir John Megaw made an attempt, with the co-operation of the local doctors, to investigate the nutritional conditions in the villages. Such a scheme, with the help of practitioners and with suitable objective methods for collecting data about children, infantile and puerperal mortality are the lines on which such a survey should be carried out.

Perhaps a word or two on the possible expression of malnutrition in the adult might not be out of place. A glance at the vital statistics of India shows that the expectation of life is considerably below that of Europeans. It is

hardly likely that this is due entirely to the toll taken by the major scourges in this country. A similar contrast holds for the infant mortality which in some areas does seem to be correlated with the poverty of the mother's diet. In addition, the incidence of a disease such as nephritis is relatively high among Indians (who are prevailingly low protein eaters) in view of the current theory that high protein, particularly meat ingestion, is a contributing cause. In other words one gets the impression that the fabric of the Indian body was not built to stand the test of time. The absence of many signs of malnutrition in early years may have been due simply to what provisionally may be called a well-balanced deficiency in the diet. In the end the problem comes down to that of the child and as a corollary the pregnant and nursing mother. It is too early to theorize as to what may be the food deficiencies involved in many of the conditions mentioned above until complete figures are available of the composition of Indian foods as regards all their essential constituents.

Fresh scientific discoveries which are constantly adding to the number of known vitamins and indeed even different active forms

of the same vitamin greatly complicate the subject. The validity of such discoveries cannot be questioned although their significance in human nutrition has yet to be assessed. There can be no question about the importance of being able to assess the value of a diet quantitatively in terms of chemically distinct substances, but the food of a living organism should be considered as a whole. The source of a cereal, the kind of flesh or the general texture of a diet cannot be a matter of indifference. The ultimate fate of food is after all to become an integral part of the living cell, a process of synthesis, while the modern sophistication of foods, not necessarily to be condemned in moderation, is for the most part one of analysis. The diet of a nation should be composed of as wide a selection as possible of available foods based on a scientific knowledge of their values and they should not be unduly manhandled either in the factory or the kitchen. The ideal in feeding of a people should be to provide a 'square meal' which in the language of modern dietetics may be defined as one which is well balanced from the point of view of bulk as well as flavour and in the approximately correct proportions of essential constituents.

Commentary

CEYLON JOURNAL OF SCIENCE*

THIS type of survey merits the serious attention of public health workers the world over. Ceylon like India offers marked differences in economic grades and cultural types, which open up the field for comparative studies on the influence of diet and disease on physique. Dr. Nicholls has made full use of the facilities afforded him in the production of this brochure. The survey includes height and weight measurements of children and adolescents, a diet survey, infant, maternal and total mortality. In addition there are a number of clinical observations on conditions such as phrynoderma, caries, stomatitis and malocclusion of teeth which are deserving of special attention. The data on the physical measurements are in general what one might expect, the poorer classes are slightly less in height and considerably less in weight than the better off ones. The discussion on the causes of malocclusion is suggestive and interesting. The permanent teeth are displaced, it is thought, owing to there being too little room in the jaw to accommodate them. No direct nutritional cause can be assigned to this but the condition is much commoner among the poorer classes. As this part of the jaw is almost completely developed by about the seventh year of life it is considered that malnutrition during

the infant period or even in gestation may have hindered the growth of the jaw. These observations are interesting and the reviewer himself has noted a considerable amount of both caries and dental malformations in Calcutta children although there was complete absence of many of the other signs of malnutritional disease (unpublished). The fifty odd pages of this paper are full of useful and interesting information and undoubtedly mark the type of report which should be coming from all enlightened countries in view of the importance of the subject of nutrition in the public health policy of to-day.

H. E. C. W.

Medical News

ALL-INDIA OPHTHALMOLOGICAL CONFERENCE

THE fifth conference of the All-India Ophthalmological Society will be held in Lahore from the 20th to 22nd December, 1936. Lieutenant-Colonel E. O'G. Kirwan, I.M.S., will preside. One session of the conference will be devoted to a discussion on the ocular disorders in diabetes.

Xmas concessions will be available at the time on all railways.

B. N. BHADURI,
G. ZACHARIA,
Honorary Secretaries.

THE D. S. Adenwalla Gold Medal for 1935 has been awarded to Captain K. L. Sen, F.R.C.S.E., for his work on 'Studies on the ocular changes due to vitamin-B deficiency' in albino rats.

* *Ceylon Journal of Science*, 1936. 'A Nutritional Survey of the Poorer Classes in Ceylon'. By Lucius Nicholls, M.D., B.C.

FIRST INTERNATIONAL CONFERENCE ON FEVER THERAPY

The First International Conference on Fever Therapy is to be held at Columbia University, New York City, U. S. A., from 29th September to 3rd October, 1936.

The subjects to be discussed will include physiologic and pathogenic changes as well as the treatment of gonorrhœa, both in the male and in the female; gonorrhœal and non-specific arthritis; syphilis in its various stages; neurologic conditions such as multiple sclerosis, chorea, paresis, tabes, skin diseases, etc.

Abstracts of the papers to be read are to be published in the volume of the transactions in English, German and French.

Information regarding this Conference may be secured from the General Secretary, Dr. William Bierman, 471, Park Avenue, New York City, U. S. A.

IMPORTANT CONFERENCES

We give below the accounts of the first Anti-Tuberculosis Conference, the first Obstetric and Gynecological Congress and the fourth meeting of the Ophthalmological Society.

The first of them was a semi-official conference held under the auspices of, and at the expense of, the King George Thanksgiving (Anti-Tuberculosis) Fund so that the numbers attending it were not large, but this was made up for by the fact that all the members were experts in the subject.

The other two are open to any medical practitioner who becomes a member of the society concerned and is willing to pay his own expenses in attending the conference, and as evidence of the interest in these important subjects it is noted that nearly 300 delegates attended this inaugural obstetric conference and at the ophthalmological conference the attendance is described as 'good' but the actual numbers are not obtainable from the report.

It is pleasing to be able to record together in this number the deliberations on three subjects of such great importance to the health of the Indian people, for these three publications reached our office within a few days of each other. We feel that the accounts of these three meetings give ample evidence that the medical profession of this country, both official and non-official, are fully alive to the gravity of many of its major health problems and are doing all in their power to combine in fighting them.

TRANSACTIONS OF THE FIRST ANTI-TUBERCULOSIS CONFERENCE HELD IN NEW DELHI, NOVEMBER 1934

The King George Thanksgiving (Anti-Tuberculosis) Fund has now been in existence some years, and hitherto we have received the annual report of its activities. We have just received the transactions of the first Anti-Tuberculosis Conference held in New Delhi in November 1934.

The conference was opened by the Honourable Khan Bahadur Mian Sir Fazl-i-Husain, K.C.S.I., K.C.I.E., K.L., on the morning of the 4th November, and we give the following abstracts from his speech.

'Ladies and Gentlemen,—I have very great pleasure in welcoming you to this conference, which has been called to deal with various problems connected with tuberculosis. It is admitted on all hands that tuberculosis is the most widespread of all the infectious diseases. It is the greatest enemy of mankind and kills one person out of every seven or eight born in the world. Unlike plague and cholera, which have a periodical incidence depending upon climate and weather, and affect only a localized territory, tuberculosis is present at all times and all places.

The extent of its prevalence in India cannot be judged accurately, but it is accepted on all hands that as the result of overcrowding and insanitary conditions of our cities and towns, together with chances of repeated and massive infection with the tubercle germ and the low vitality of the masses, it is increasing rapidly from day to day.

The Public Health Commissioner with the Government of India says in his Annual Report for 1932:—

'Various comments have been made as to the prevalence of tuberculosis in India but no accurate estimate of its incidence is possible. Assuming that 2 per cent of the total deaths are due to tuberculous disease, then nearly 150,000 persons die annually from this infection. But some experts hold that 10 per cent is nearer the truth, and on that basis tuberculosis deaths would number 650,000. The latter is almost certainly an exaggerated figure but it is probable that the actual number of deaths lies somewhere between these two extremes and, even taking the lesser figure, the situation is serious enough.'

Though such a high toll is taken by this disease, yet the worst feature of the disease is the high morbidity rate and the long drawn out suffering that the prolonged illness causes.

Solution

Is there a solution to this problem? The ideal method of dealing with such a problem would be to remove the source of infection and to provide sanatoria for curable cases, hospitals for the incurables, colonies for convalescents and preventoria for the susceptible cases, and compulsorily segregate every one of the cases and control their movements.

But to suggest such a scheme for India would be quite outside the range of practical politics. Moreover, the disease is not solely a medical problem but is also associated with ignorance and certain social and economic conditions of living, viz, poverty, disease, overcrowding, insanitation, malnutrition, in fact everything which lowers the vitality of the people. Therefore the preventive measures resolve themselves into five distinct groups:—

- (1) The removal of ignorance by educating the public as to the causes and preventive measures necessary to fight the disease.
- (2) The betterment of conditions of living.
- (3) The removal of certain social customs and vices.
- (4) The provision of tuberculosis dispensaries to diagnose the cases early.
- (5) Establishment of sanatoria, hospitals, colonies, etc., for the patients who cannot be treated properly in their own homes.

Every one of these measures is necessary to fight the scourge and all these have been used in civilized countries to mitigate human suffering and loss of life which result from tuberculosis. A very great degree of success has been achieved in progressive countries like England and America.

Sir David Petrie, K.L., C.I.E., C.V.O., O.B.E., then took the chair for the opening session and after making a short speech, the work of the conference began; this consisted of the reading of papers and discussions on them by the twenty-four delegates, all of whom are experts on the subject of tuberculosis in one or other of its many aspects.

It is not decided how often this conference is to meet, but unfortunately, on account of expense, it is not possible to hold it annually at present, because the expenses of the delegates are a charge upon the Fund.

The first issue of the 'Transactions' is very well produced and we congratulate Dr. A. R. Mehta, the organizing secretary of the Fund, who is responsible for it. The only criticism we have to offer is regret that it was not issued until practically eighteen months after the conference was held.

PROCEEDINGS OF THE FIRST ALL-INDIA OBSTETRIC AND GYNÆCOLOGICAL CONGRESS, MADRAS

This publication, composed of 188 pages, gives a full account of the first meeting of the above congress held in January 1936. The Governor of Madras, Lord Erskine, attended and inaugurated the opening session in the following speech:—

'I must at the outset confess that it was not without some feelings of apprehension that I accepted your committee's kind invitation to inaugurate this congress

hardly likely that this is due entirely to the toll taken by the major scourges in this country. A similar contrast holds for the infant mortality which in some areas does seem to be correlated with the poverty of the mother's diet. In addition, the incidence of a disease such as nephritis is relatively high among Indians (who are prevailingly low protein eaters) in view of the current theory that high protein, particularly meat ingestion, is a contributing cause. In other words one gets the impression that the fabric of the Indian body was not built to stand the test of time. The absence of many signs of malnutrition in early years may have been due simply to what provisionally may be called a well-balanced deficiency in the diet. In the end the problem comes down to that of the child and as a corollary the pregnant and nursing mother. It is too early to theorize as to what may be the food deficiencies involved in many of the conditions mentioned above until complete figures are available of the composition of Indian foods as regards all their essential constituents.

Fresh scientific discoveries which are constantly adding to the number of known vitamins and indeed even different active forms

of the same vitamin greatly complicate the subject. The validity of such discoveries cannot be questioned although their significance in human nutrition has yet to be assessed. There can be no question about the importance of being able to assess the value of a diet quantitatively in terms of chemically distinct substances, but the food of a living organism should be considered as a whole. The source of a cereal, the kind of flesh or the general texture of a diet cannot be a matter of indifference. The ultimate fate of food is after all to become an integral part of the living cell, a process of synthesis, while the modern sophistication of foods, not necessarily to be condemned in moderation, is for the most part one of analysis. The diet of a nation should be composed of as wide a selection as possible of available foods based on a scientific knowledge of their values and they should not be unduly manhandled either in the factory or the kitchen. The ideal in feeding of a people should be to provide a 'square meal' which in the language of modern dietetics may be defined as one which is well balanced from the point of view of bulk as well as flavour and in the approximately correct proportions of essential constituents.

Commentary

CEYLON JOURNAL OF SCIENCE*

THIS type of survey merits the serious attention of public health workers the world over. Ceylon like India offers marked differences in economic grades and cultural types, which open up the field for comparative studies on the influence of diet and disease on physique. Dr. Nicholls has made full use of the facilities afforded him in the production of this brochure. The survey includes height and weight measurements of children and adolescents, a diet survey, infant, maternal and total mortality. In addition there are a number of clinical observations on conditions such as phrynoderma, caries, stomatitis and malocclusion of teeth which are deserving of special attention. The data on the physical measurements are in general what one might expect, the poorer classes are slightly less in height and considerably less in weight than the better off ones. The discussion on the causes of malocclusion is suggestive and interesting. The permanent teeth are displaced, it is thought, owing to there being too little room in the jaw to accommodate them. No direct nutritional cause can be assigned to this but the condition is much commoner among the poorer classes. As this part of the jaw is almost completely developed by about the seventh year of life it is considered that malnutrition during

the infant period or even in gestation may have hindered the growth of the jaw. These observations are interesting and the reviewer himself has noted a considerable amount of both caries and dental malformations in Calcutta children although there was complete absence of many of the other signs of malnutritional disease (unpublished). The fifty odd pages of this paper are full of useful and interesting information and undoubtedly mark the type of report which should be coming from all enlightened countries in view of the importance of the subject of nutrition in the public health policy of to-day.

H. E. C. W.

Medical News

ALL-INDIA OPHTHALMOLOGICAL CONFERENCE

THE fifth conference of the All-India Ophthalmological Society will be held in Lahore from the 20th to 22nd December, 1936. Lieutenant-Colonel E. O'G. Kirwan, I.M.S., will preside. One session of the conference will be devoted to a discussion on the ocular disorders in diabetes.

Xmas concessions will be available at the time on all railways.

B. N. BHADURI,
G. ZACHARIA,
Honorary Secretaries.

* *Ceylon Journal of Science*, 1936. 'A Nutritional Survey of the Poorer Classes in Ceylon'. By Lucius Nicholls, M.D., B.C.

THE D. S. Adenwalla Gold Medal for 1935 has been awarded to Captain K. L. Sen, F.R.C.S.E., for his work on 'Studies on the ocular changes due to vitamin-B deficiency in albino rats'.

could help them to catch a vision of service to our great village population, and be determined to go out and raise the standard of medicine in the surrounding country, it would be immensely worth while; this leads us to our second phase of the country problem.

The problems that face practitioners and trained midwives in the villages, are great, whether they work privately, or in small outpost dispensaries. They meet more difficult obstetrical and gynaecological problems than those met with in large city hospitals. The demand upon their knowledge and skill is great. Trained in large centres where the equipment is adequate and even lavish, the practitioner in a village is often face to face with very limited supplies—a poor assortment of instruments and inadequate sterilizing and hospital equipment, and they become discouraged, then lapse into slipshod methods which lead to very faulty technique—with all its disastrous results.

Would it be possible for the congress to organize in such a way that through our central base these practitioners, nurses and midwives would be carefully supervised, and be given an opportunity at stated intervals to study (perhaps for a month each year) in some large central hospital and be expected to undergo post-graduate courses at the expiration of a certain number of years. In this way our standards would be raised. Village practitioners should not confine themselves to the medical problems alone, but to the general uplift of the villagers.

Let us, as a newly-organized congress, allow no opportunity to pass, but let us press forward, so that in the future this obstetrical and gynaecological congress of India may be one of the most outstanding in the world. This can be done if we all work together.

Your Excellency, I trust that in the future you may look back upon this occasion as one of the great advance steps made in India during this decade. May to-day be epoch-making. I desire to extend my congratulations to and appreciation of the splendid work that has been done by Dr. Lakshmanaswami Mudaliar, Dr. Lazarus, Dr. Smith, Dr. Phabhu and others of the Madras congress, to whom we are especially indebted for this meeting, and in looking over our programme, we are delighted to find names of those who have done outstanding work in India and whom we have often longed to meet face to face; to-day we have this opportunity and rejoice in it.

May we be inspired to go forward with greater zeal and enthusiasm than ever before, to do outstanding work along these important lines, which will be recognized the world over. We have opportunities for service to womanhood that few have and may we be worthy of this great calling to lead in the future in all matters pertaining to obstetrics and gynaecology.

The afternoon session on the 2nd January and the whole of the two succeeding days were devoted to the consideration of 24 original papers which are given in full in the 'Proceedings', and at the final business meeting the following resolutions were adopted:—

1. 'This congress is of opinion that, for the proper training of the medical students, it is necessary that a course of six months' training in an obstetric and gynaecological hospital, or an obstetric and gynaecological ward and outpatients attached to a general hospital, should be insisted upon, three months being spent in the pre-final year and three months in the final year. The congress is also of opinion that every student should conduct personally 20 cases of labour, of which 5 cases should be conducted under supervision in a maternity institution'.

2. 'Resolved that the next congress be held in Bombay during Christmas season 1937-38, the subjects for discussion being:

Obstetrics: Toxæmias of pregnancy.

Gynaecology: Cancer of the cervix'.

3. 'Rules were also framed for forming a permanent organization to carry on the business of the congress between its sessions'.

This congress cannot fail to be eventually of the greatest benefit to India for it deals with one of the major public health problems of this country. We

wish it all success in future years and look forward with interest to future numbers of the 'Proceedings'.

PROCEEDINGS OF THE ALL-INDIA OPHTHALMOLOGICAL SOCIETY. VOLUME IV. SESSION 1935. Pp. xix plus 279. ILLUSTRATED

This society is now firmly established and the present volume is the fourth annual publication. It is pleasing to note that this important society is steadily increasing and that during the year there was a net increase of 27 in its membership, bringing the total to 141.

The 279 pages which this volume contains is mainly devoted to scientific papers on ophthalmological matters. It is an exceedingly well-produced volume printed on heavy art paper and contains six good coloured plates. The society and the printers are to be congratulated on this publication which is improving every year and must be of great use to practitioners in India especially in the country districts.

On account of the immense importance of eye diseases in India the Ophthalmological Society is of great benefit to the country and we wish it the continuance of its well-deserved success.

UNITED PROVINCES MEDICAL COUNCIL, LUCKNOW

Minutes of the meeting of the United Provinces Medical Council held at Lucknow on 30th March, 1936

1. The minutes of the last meeting were confirmed subject to certain corrections made.

2. Read, Medical Council notification no. 1009/Mem.(c), dated the 3rd December, 1935, notifying re-election, by the Executive Council of the Lucknow University, of Lieut.-Colonel H. Stott, O.B.E., M.D., F.R.C.P., D.P.H., I.M.S., Dean, Faculty of Medicine, as a member of the United Provinces Medical Council from 22nd December, 1935.

RECORDED.

3. 'Resolved that with reference to the draft rules published in the *United Provinces Gazette*, dated the 17th September, 1935, regarding the appointment of honorary surgeons and physicians, this Council recommends to the Government that length of private practice, status in the profession and experience of the subject should be amongst the guiding factors in the matter of making such appointments, and that foreign qualifications should not be given preference over Indian qualifications, simply by virtue of their being foreign'.

4. The following resolution was proposed by Captain K. P. Bagchi:

'Resolved that this Council recommends to the Government that in clause 8 of section 3 of the Lunacy Act, IV of 1912, the definition of a "Medical Practitioner" as "a holder of a qualification to practise medicine and surgery, which can be registered in the United Kingdom", the words "in the United Kingdom" be deleted and replaced by the words "by a medical council of any province in India", and in clause 1 of section 5 of the same Act, the words "one of which shall be from a medical officer", be deleted and replaced by the words "from two registered medical practitioners".'

Resolved that the Council accepts the principles of resolution no. 4 but, as there are many other factors involved, the President may be asked to put draft rules on the subject before the next meeting of this Council.

5. Government Orders nos. 2945, dated the 4th January, 1936, and 88/V—570, dated the 8th February, 1936, and President's note recommending that provident fund benefits be given to the Registrar, were considered.

Resolved that the President's recommendations be endorsed and provident fund be sanctioned for the Registrar. They also asked the Registrar to submit a scheme for establishing provident fund for the clerks at the next meeting.

6. Letter no. 51-65, dated the 17th January, 1936, from the Registrar, Bihar and Orissa Medical Council

to-day. The position of a layman who is called upon to address a gathering of experts on their own particular subject is not an easy one. I feel that there is very little I can add to your chairman's eloquent survey of the general aspects of this congress, and absolutely nothing that I can contribute towards your scientific discussions. My function, then, is to be brief, and to say what I have to say not so much to you men of science and medicine gathered here, but rather through you to the public of India at large.

I would first like to tell you how very much impressed I am by the striking demonstration of enthusiasm for the cause of the mothers and children of India that is afforded by the large and widely representative assemblage that I see here before me. It must have cost a great deal of trouble and energy to organize this congress and no little trouble to many of you to come long distances to attend it, and I would like to offer my most cordial congratulations and welcome to all who are participating. Your keenness augurs well for the advancement of your subject, and the holding of this congress is assuredly a legitimate source of pride and inspiration to us all.

It would be an impertinence for me to labour the importance of this subject to you who are gathered in this hall, but I am not so sure that its importance and its magnitude are sufficiently realized by the general public. Here in Madras, as your chairman has said, we were among the first to tackle those problems. We claim to be second to none in both the study and the practice of this branch of medical science and we are proud of the fact that doctors come from all over India to attend the post-graduate courses at our Maternity Hospital. Yet in spite of all this, we have to admit that the mortality rate amongst mothers in Madras is four to five times as high as the mortality rate in Great Britain. Surely no stronger evidence is required of the work that is yet to be done both in the field of practical training and also in the development of a public sanitary consciousness, and when I say that no fewer than 4,000 maternity cases have been dealt with during the past year in one Madras hospital alone, there can, I think, be no more striking proof of the extreme urgency of this work.

Maternal mortality

The question of maternal mortality is one that is now occupying a prominent place in the mind of most civilized countries. Many important advances have been made of late years both in obstetrical treatment and in the appliances used in that treatment, such as those which are on view in your exhibition to-day. Here in India we may claim that our Governments have not been slow to recognize their duty towards the advancement of this science, while our professional men have been eager to take advantage of the latest discoveries and improvements. But we have a vast country and an immense population to deal with, and in a tropical land there are many and varied problems not met with elsewhere. What is wanted is a wider propagation of the knowledge already to hand and a more intensive research into the peculiar problems connected with tropical diseases. Surely, ladies and gentlemen, there is no cause more truly deserving of popular interest, practical assistance and financial support. To save the mothers of India from suffering, disease and death, and to rear up healthier, happier children—this is a task than which none could be dearer to the heart of any nation. Let the people of India see to it that nothing is wanting to the advancement of that cause which they can achieve by their endeavour and their charity.

For your part, ladies and gentlemen, you have surely chosen the best means towards that end by gathering here for an exchange of experience and mutual discussion of your problems. I feel sure that this congress will of itself result in a big step forward in scientific knowledge. I understand that though it is the first of its kind to be held, it will by no means be the last, and that it is intended to extend the organization of provincial societies, which is already functioning so

well here and in Bombay, on a permanent footing and throughout India. It is a fine purpose that you have before you and I am confident that the time is not far distant when that purpose will be triumphantly fulfilled. I wish this congress all possible success and have very great pleasure in declaring it and its allied exhibition open.

Miss Ida Scudder, the Principal, Women's Medical School, Vellore, was elected as the first president.

For an inaugural meeting it was remarkably well attended, there being well over two hundred delegates not including the executive officers which numbered nearly fifty so that the total attendance was little short of three hundred.

The president delivered an address from which we have made the following abstracts:—

'It is with especial pleasure that I have the honour of giving you all a welcome to this, the first obstetrical and gynaecological congress of all India. The impressions and inspirations which result from such meetings are always far-reaching.

Here in Madras a great forward step has been taken, and to-day we meet as the first all-India obstetric and gynaecology congress whose influence should be felt not only in India but throughout the world, for in India we find certain operations and diseases peculiar to this land.

The two existing associations of Madras and Bombay since their organization have done good work and it is the hope of this congress that every province will organize its provincial association and that we may look forward to a great future of usefulness, when an all-India obstetrical and gynaecological congress may be held yearly, or possibly biennially with all provinces represented.

What should be some of the aims of this congress?

As an outcome of this congress, research should be stimulated, and, with this end in view, we should encourage the establishment of an Indian obstetrical and gynaecological journal in order that there may be mutual help and inspiration through the interchange of experience and knowledge.

Standards in the villages must be raised. Few young doctors leave their schools and colleges without a desire to give good service to their patients.

The older practitioners need to keep apace with modern methods as surely as the young members of the profession. Therefore, as an obstetrical and gynaecological congress, can we not establish a journal worthy of the cause?

With concentrated effort, India should be able to lead in these subjects, for here in India we have unique opportunities and unlimited material for research along obstetrical and gynaecological lines as well as unequalled opportunities for alleviating suffering among women.

Secondly, our aim should be to attack the obstetrical problem of the villages which we all (and especially those of us who work in the mofussil) realize is well nigh insurmountable.

The uneducated *dai*, steeped in superstition and ignorance, frequently and unwittingly brings untold suffering and death to her patient. Many efforts have been made in the past to solve this question, but it is so vast that we have often faltered because of its magnitude. We must consider what we can, as a congress, do in attacking this problem. Our help and stimulation is needed, and our standards should be raised. Could this not be done through a central organization whereby a frequent and careful supervision of all obstetrical and gynaecological work could be carried on? If all the ignorant *daïs* could be replaced by well-educated and trained midwives and nurses, the future problem would be simplified.

One of our greatest needs in India to-day is co-operation: (a) between all medical workers; (b) between district boards and local bodies; and (c) between the medical workers and the villager himself.

The outlook is so vast as to make it intensely inspiring and fascinating. Instead of our young practitioners flocking to and overcrowding our cities, if we

could help them to catch a vision of service to our great village population, and be determined to go out and raise the standard of medicine in the surrounding country, it would be immensely worth while; this leads us to our second phase of the country problem.

The problems that face practitioners and trained midwives in the villages, are great, whether they work privately, or in small outpost dispensaries. They meet more difficult obstetrical and gynaecological problems than those met with in large city hospitals. The demand upon their knowledge and skill is great. Trained in large centres where the equipment is adequate and even lavish, the practitioner in a village is often face to face with very limited supplies—a poor assortment of instruments and inadequate sterilizing and hospital equipment, and they become discouraged, then lapse into slipshod methods which lead to very faulty technique—with all its disastrous results.

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5. Government Orders nos. 2945, dated the 4th January, 1936, and 88/V-570, dated the 8th February, 1936, and President's note recommending that provident fund benefits be given to the Registrar, were considered.

Resolved that the President's recommendations be endorsed and provident fund be sanctioned for the Registrar. They also asked the Registrar to submit a scheme for establishing provident fund for the clerks at the next meeting.

6. Letter no. 51-65, dated the 17th January, 1936, from the Registrar, Bihar and Orissa Medical Council

of Registration, and the report of their sub-committee laying down a minimum standard of qualification for purposes of registration was read with a view to express opinion thereon for communication to that Council.

Read to await report of the sub-committee of the State Medical Faculty.

7. Letter no. 83, dated the 25th November, 1935, from the Chairman, King George Thanksgiving (Anti-Tuberculosis) Fund, asking this Council's opinion whether the local anti-tuberculosis bodies should be independent bodies or be affiliated to the Red Cross Society, was considered.

Resolved that this Council recommends alternative 5(c) with the provision that this does not involve dependence on the Red Cross Society in matters of administrative control, collection, allocation and distribution of its funds.

8. Read the report of the Standing Committee, which met on 13th March, 1936, to approve their recommendations.

Resolved that the report of the Standing Committee be approved and their recommendations accepted.

9. With reference to resolution no. 30 of November 1935, the report, dated the 13th March, 1936, of the sub-committee appointed to suggest amendments to Medical Act and the Code of Medical Ethics was considered.

Resolved that the report be referred back to the sub-committee for further elaboration and that Rai Bahadur Dr. K. L. Chaudhri, O.B.E., be added to the personnel of the committee.

10. With reference to resolution no. 28 of November 1935, G. O. no. 2948/V-569, dated the 20th February, 1936, to the President, Medical Council, informing that the demand for provision of funds for two members of the Medical Council to visit examinations at Agra Medical School was received too late to be included in the budget for 1936-37, was read.

Resolved that the Government be requested to provide this money in the supplementary budget.

11. With reference to resolution no. 26 of November 1935, letter no. 2195, dated the 16th January, 1936, from the Director, Medical and Public Health Department, His Exalted Highness the Nizam's Dominions, Hyderabad, Deccan, and the question whether the degrees and diplomas of the Osmania Medical College should be added now to the schedule as registrable qualifications, were considered.

Resolved that the syllabus and courses of studies should first be gone into by the Standing Committee.

12. With reference to resolution no. 25 of November 1935, Registrar, Andhra University's letter no. 92-C36, dated the 23rd January, 1936, with the curriculum of M.B., B.S. examination of that University, and the question whether the said qualification should be recognized as a registrable qualification and added to the schedule, were considered.

Resolved that the syllabus and courses of studies be referred to the Standing Committee for their opinion.

13. Resolved that—

'With reference to G. O. no. 83/V-343, dated the 27th January, 1936, the matter be referred to the Standing Committee for report as to the desirability of rescinding the amendments to the rules regulating subsequent elections notified in Government notification no. 2285/V-343, dated the 21st September, 1935, because irregularities are reported by Dr. Varma to have occurred under the amended rules'.

14. Resolved that T.D.D. (Wales) and D.M.R. & E. (Cantab.) qualifications be accepted as additional qualifications.

15. Letter no. F-32-36/141, dated the 3rd March, 1936, from the Secretary, Medical Council of India, New Delhi, asking for the opinion of this Council whether Indian nationals possessing medical degrees of repute in foreign countries with which India has no reciprocity should be granted recognition in India and, if so, on what basis should they be recognized in India, and inquiring what is the present practice in this Council, was considered.

Resolved that the matter be referred to the Standing Committee.

16. Resolved that the present rate of travelling allowance plus Rs. 32 be paid to all members for attending the Medical Council Sub-Committee and Standing Committee meetings.

Resolved further that when forwarding this letter to Government practices of other provinces may be referred to—these to be furnished by Rai Sahab Dr. Ram Narain Lall.

17. [Withdrawn.]

18. [Withdrawn.]

19. [Withdrawn.]

R. N. SHUKLA, M.B., B.S.,

Registrar,

United Provinces Medical Council.

H. C. BUCKLEY,

COLONEL, I.M.S.,

President,

United Provinces Medical Council.

THE OXFORD AND CAMBRIDGE BOAT RACE

ON Saturday, 4th April, Vitamins Limited (Bemax), Chiswick, London, W., had more than five hundred medical men as their guests, from all parts of London. Stands had been erected along the river frontage and the doctors and their wives were thus able to view the Oxford and Cambridge boat race from one of the most advantageous points on the course. Harley Street and Welbeck Street were well represented at this gathering, many famous physicians and surgeons being present. A broadcasting station was located above the stands and the commentator kept the guests supplied with minute by minute information as to the progress of the race. As the crews came up the boats were almost level but just opposite the Bemax Works, Cambridge slightly increased their rate and commenced to draw away. The assembled doctors had undoubtedly the best position on the course and saw the race at its most interesting and exciting stage. Refreshments were served afterwards.

ALL-INDIA MEDICAL LICENTIATES ASSOCIATION

Special Concession to Licentiates

DURING the Dr. P. S. Ramachandra Iyer's Memorial Month (1st to 31st July, 1936), Licentiates will be enrolled as members of the Association on payment of Rs. 4 only without any entrance fees. Membership will entitle them to the *Indian Medical Journal* (the monthly organ of the Association) free for one year. The amount of the subscription may be sent to Dr. A. N. Khosla, Treasurer, All-India Medical Licentiates Association, Ripon Hospital, Simla.

KING'S BIRTHDAY HONOURS, 1936

THE following are the names of medical men and others, associated with medical institutions, in the Indian Honours List of date 23rd June, 1936. We offer them our congratulations:

Knighthood

Major-General C. A. Sprawson, C.I.E., Director-General, Indian Medical Service.

C.I.E.

Lieutenant-Colonel J. J. Harder-Nelson (late Principal and Professor of Medicine, King Edward Medical College, Lahore).

Mr. R. D. Dalal (late of the Public Health Department, Bombay).

O.B.E. (Civil Division)

Lieutenant-Colonel A. N. Palit, Civil Surgeon, Cuttack, and Superintendent, Orissa Medical School.

Captain Rajkishore Kacker, Medical Superintendent, King Edward VII Sanatorium, Bhowali, U. P.

*Kaiser-i-Hind Medal**First Class*

Miss Mary Davison, Lady Superintendent, Baroda State General Hospital.
 Dr. Ruth Young, Principal of the Lady Hardinge Medical College, New Delhi.
 Mr. R. B. Billimoria, Private Medical Practitioner, Bombay.

M.B.E. (Civil Division)

Mrs. H. M. Vorstermans (lately Lady Superintendent, Bowring and Lady Curzon Hospitals, Bangalore).
 Mr. K. D. Khambata, Health Officer, Poona City Municipality.
 Mr. G. McGuire, Assistant Inspector-General, Civil Hospitals, Punjab.

Khan Bahadur

Khan Sahib Munshi Saiyed Wahiduddin Haidar, Provincial Medical Service, Civil Surgeon, Shahjahanpur, U. P.
 Khan Sahib Dr. Yar Mohammad Khan, Clinical Assistant to Professor of Medicine, King Edward Medical College, Lahore.

Rai Bahadur

Mr. Tridib Nath Banarji, Professor of Medicine, Medical College, Patna.
 Captain Santosh Kumar Mukherji, Medical Officer in charge of Medical Ward, King Edward Hospital, Indore.
 Mr. Chandra Mohan Mazumdar, District Medical Officer, Bengal Nagpur Railway, Adra, Bihar.

Rao Bahadur

Sundaram Ayyar Ramkrishnan Avargal, Professor of Bacteriology, Medical College, Madras.
 Rao Sahib Trichinipoly Adimulan Pillai Raja Pillai Avargal, Medical Practitioner, Coimbatore.

Sardar Sahib

Assistant Surgeon Shiv Charan Singh Datta, Civil Medical Department, Baluchistan.

Khan Sahib

Mr. Hamid Hasan Khan, Provincial Subordinate Medical Service, U. P.
 Mr. Mahomed Hussain, Selection Grade, Sub-Assistant Surgeon, Civil Hospital, Yenangyaung, Burma.
 Mr. Muhammad Ali, Officiating Civil Surgeon, Betul, C. P.
 Dr. Saranjam Khan, Civil Surgeon, Kohat.

Rai Sahib

Mr. Bhagvati Prasad Mital, Medical Officer of Health, Naini Tal.
 Mr. Jaya Nand Barthwal, Provincial Subordinate Medical Service, Garhwal, U. P.
 Mr. Beli Ram, Chief Medical Officer, Tehri Garhwal State, U. P.
 Shiv Narain Rozdon, Municipal Medical Officer of Health, Amritsar.
 Babu Bhabani Charan Das Gupta, Health Officer, Puri District Board.

Rao Sahib

Mr. Colar Basanath Rai, Selection Grade, Sub-Assistant Surgeon, Bogale, Pyapon District, Burma.

Current Topics

The Treatment of Cerebral Emergencies

By F. W. WILLWAY, M.D., M.S., B.Sc., F.R.C.S.

(Abstracted from the *Medical Press and Circular Supplement*, 15th January, 1936, p. 17)

WHILE it is axiomatic that accurate diagnosis must precede treatment, it is in the realm of cerebral emergencies that the surgeon often meets the greatest difficulty in diagnosis. It is preferable to substitute for 'treatment', which suggests active procedures, the word 'management', this to include such investigations and measures as the individual case suggests. For if we except the all-important therapeutic measure of rest, it is frequently by the surgeon's skilful management in the avoidance of treatment that a successful result is obtained. Urgent cerebral conditions fall into three main categories, *viz*:

- (1) Head injuries with cerebral lesions immediate or remote.
- (2) Urgent conditions arising in association with cerebral tumours.
- (3) The numerous medical conditions which may lead to coma.

Of these categories the various medical disorders usually listed as the causes of coma undoubtedly provide the bulk of cerebral disaster but they fall outside the scope of this article.

To take the second category next: urgent cerebral conditions in association with intracranial tumours are not very common. A hæmorrhage into a vascular tumour may, however, lead to sudden loss of consciousness, and also to exacerbation of signs and symptoms previously present. These cases are very difficult to elucidate without knowledge of their previous history. If this is not forthcoming from relatives or friends, the effect of an intravenous saline (30 c.c.

of 30 per cent saline) may be tried as a desperate measure to resuscitate the patient in order to secure his co-operation. The effect of such a saline may be dramatic, though it increases the risk of further hæmorrhage. Occasionally an individual symptom or sign (*e.g.*, a sudden increase in papilloedema) may render an urgent decompression necessary. Rarely patients may collapse while minor investigations are being carried out (*e.g.*, ventriculography, encephalography, etc.) and require urgent major relief. These conditions are, however, rarities, and the bulk of surgical urgent cerebral conditions are due to trauma, and the remainder of this article will be devoted to a consideration of these cases.

One general point may be stressed at the outset, namely, the *supreme value of full repeated examination* coupled with written notes of the findings on each examination. Most urgent cerebral lesions are progressive in nature, and there is often a 'march of events' which when seen in review makes the diagnosis clear. Often the findings at a single examination are extremely difficult to interpret, but the sequence of symptoms noted at successive examinations clearly indicate the lesion.

A case recently seen illustrates this principle well. C. E. A., aged twenty-five years, was admitted to another hospital in an irritable state following a head-on motor-cycle crash. He was bleeding freely from the right ear and from his nose. Successive examinations revealed the following march of events; they are summarized in brief:

2-45 p.m. (on admission): Pulse 60; pupils equal and react sluggishly; knee-jerks—left present, right absent; planters $\psi\psi$

3 p.m.: Pulse 48; vomiting blood.

4-30 p.m.: Lumbar puncture—pressure 260; fluid blood-stained, only 2 c.c. withdrawn.

5-10 p.m.: Blood pressure 170/90; pulse 60.

6-45 p.m.: Left pupil dilated and fixed; right pupil small, reacts slowly; right leg spastic; double ankle clonus; stertorous respiration; pulse 60.

7-30 p.m.: Respirations more stertorous; pulse 100, but irregular; right pupil small, but now inactive.

9 p.m.: Both pupils dilated and inactive; deeply unconscious.

Death occurred in the early hours of the following morning.

I saw this patient for a colleague at 3-30 p.m., and decided that there was then no definite evidence of a hæmorrhage, but recommended that lumbar puncture be performed and a careful watch for any progressive changes be kept. I was not asked to see the patient again, and to my great regret learnt of his death after what was a clear picture of left-sided cerebral compression. The post-mortem findings revealed a large extradural hæmorrhage from the left middle meningeal artery. There was also some subdural hæmorrhage which accounted for the blood-stained cerebro-spinal fluid.

Examination may be repeated every two hours if necessary, while the memory should not be relied upon to store the findings, otherwise some hours later, when some change has occurred and perhaps some sign reversed, one is tempted to doubt the original observation. It is impossible to exaggerate the value of repeated examination, as the very cases where surgery can provide its most dramatic results, namely, cases of intracranial hæmorrhage, are those where frequently a march of events is observed.

HEAD INJURIES WITH CEREBRAL LESIONS

A blow on the head may expend its force on the scalp, the skull, the brain or any combination of these three. It is not proposed to deal here with injuries to the scalp or skull, as they are outside the scope of this article, although their treatment often runs *pari passu* with the cerebral lesion. It should be remembered that a fracture of the skull is only of importance in as far as it is associated with, or can lead to, subsequent cerebral damage. A fracture may even be beneficial in that the force of the blow is expended in damaging the skull rather than the brain, and the fracture may provide a slight decompression effect. A fracture becomes of paramount importance when it is compound, with associated risk of infection spreading to the brain or meninges, or it is depressed, leading to direct cerebral compression, or it is associated with damage to the meningeal or other vessels, leading to compression of the brain. In each of these cases urgent operative measures are required. In other cases of fracture, however, no treatment is required for the fracture, but only for the concomitant cerebral damage.

For working purposes injuries to the brain may be classified into four main clinical categories, though numerous intertypes exist.

These types will now be considered in some detail.

THE CASE OF SIMPLE CONCUSSION

Concussion exists in three stages: Stage I, acute onset; Stage II, partial recovery; Stage III, final recovery or remote sequelæ. The medical practitioner usually sees the patient in the second stage, when cerebral function is returning, but the patient is dazed and confused. A careful note of the degree of consciousness is made and the patient interrogated as to what he last remembered before the accident (*e.g.*, leaving a shop, coming out of school), and first remembered after the accident (*e.g.*, a policeman arriving, being in the chemist's shop). This is of considerable medico-legal importance in view of subsequent litigation, and is useful for comparison should the state of retrograde amnesia develop. As soon as the patient has recovered from the state of immediate shock a full examination is made, followed by lumbar puncture. Only a few drops of cerebro-spinal fluid are allowed to

escape to see whether they are clear or blood-stained, and also to determine the pressure.

The management of simple concussion.—Here there is little need for active treatment. A period of three weeks' rest is advised, as this lessens the risk of complications. These complications are, firstly, the development of the post-concussional state, and, secondly, the possibility of a delayed intracranial hæmorrhage. The post-concussional syndrome characterized by headaches, inability to concentrate, minor impairment of memory, mental irritability, etc., is undoubtedly more liable to occur if the preliminary period of rest has been inadequate. It is a condition more easily prevented in this way than treated when established. When its symptoms threaten it cannot be over-emphasized that its treatment is absolute rest and not a prescription for bromides to take to the chemist. Symonds and Jefferson in a recent article have stressed the fact that this period of rest should not become one of boredom, and that a graded return to normality should be aimed at. Intracranial hæmorrhage is a rare occurrence after the first twenty-four hours, but may occur even as late as six weeks after the accident.

This delayed hæmorrhage, 'spatopoplexia', may be determined by any cause of sudden rise of blood pressure, *e.g.*, physical over-exertion, straining at stool, violent coughing, etc. It is obvious that this complication is less likely to occur if the patient is resting for an adequate period, and even if it should then occur it is more amenable to immediate diagnosis and treatment. There is therefore every reason to adhere to the old-fashioned dictum—'three weeks' rest from the date of the last symptom'. Patients often resent this advice and return to their occupation much sooner and suffer no ill effect, but this should not alter the surgeon's attitude. A possible criterion for discrimination is the consideration of the patient's occupation. The less mentally arduous his position, the sooner he may return to it, providing again that it is not too violent physically. An x-ray of the skull must be taken in all cases for medico-legal reasons, and to assist in assessing compensation.

THE CASE OF CEREBRAL IRRITATION

Here the clinical picture is very different. The patient, who has usually primarily been concussed, fails to make the usual rapid recovery from that state, but passes into what is termed the irritable state. He lies curled up and resents examination and nursing attention. Periods of somnolence may alternate with bouts of restlessness which may border on mania. Normally there are no paralyses, and after the initial period of concussion the patient is not unconscious. *The mechanism of the body is intact, but the government has departed.* This condition may persist many days, and even weeks, but the ordinary simple case begins to improve towards the end of the first week.

The management of the case of cerebral irritation.—Here, again, the avoidance of complications is the object of treatment. The complications to be feared are broncho-pneumonia, urinary infection, bed sores and the ever-present risk of intracranial hæmorrhage. The nurse is instructed to turn the patient from side to side to lessen the risk of pneumonia. Feeding has to be undertaken very cautiously, and the mouth kept very clean. Incontinence is more usual than retention, but the latter must be watched for and dealt with along the usual lines. Routine lumbar puncture is performed at the commencement of treatment; this indicates whether there is any subarachnoid hæmorrhage (a factor in prognosis), also whether the intracranial tension is high. Routine dehydration should not be undertaken. It is a procedure not without risk, and should be reserved for those cases where tension is high and symptoms are present. There is no harm in exhibiting magnesium sulphate by mouth, $\frac{1}{2}$ oz. of a saturated solution two-hourly: this often benefits the patient without producing excessive purgation. Magnesium sulphate in 10 per cent solution may be given per rectum, 10 oz. every six hours. Stronger

solutions should not be used as there is a definite risk of proctitis. Dehydration by the intravenous route should only be used in a severe exacerbation or to arouse a patient to demonstrate localizing signs should major surgery be intended. Morphia is to be avoided unless the patient is violent. Then it may be wiser to quieten the struggling patient to reduce the risk of a hæmorrhage rather than to withhold morphia, so that if hæmorrhage occurs its symptoms will not be masked. As a routine sedative paraldehyde by the rectal route is the best drug. The nurse must always be on guard to detect the onset of unconsciousness due to compression. This unconsciousness has sometimes been mistaken for sleep and gratefully welcomed by the harassed attendants. In uncomplicated cases of cerebral irritation it is a great problem to decide which cases would benefit by a decompression opening. So many cases recover spontaneously after a few days' rest that the surgeon would hesitate to undertake a major procedure. When, however, a severe case of irritation progresses to a fatal termination, the surgeon may wish that he had given the patient the chance of benefit that decompression offers. It is probable that the solution lies in the more accurate grading of the cases. In severe cases when, after a week's observation, there is no improvement, and the lumbar pressure is raised, a right-sided sub-temporal decompression may be of marked benefit. Of course, if there are focal signs, exploration may be undertaken much sooner, and the position of the opening varied accordingly.

THE CASE OF CEREBRAL COMPRESSION

Compression of the brain after an injury may be produced by in-driven bone or foreign bodies as in depressed and compound fractures, or by hæmorrhage. The former condition is usually obvious, and its treatment requires no elaboration. In-driven bone has, however, to be suspected in focal cases when there may be an extensive fracture of the inner table. Intracranial hæmorrhage may be either subdural (the common type) or extradural (the classical type). Subdural hæmorrhages may be diffuse, that is all over the brain surface, when blood is detected in quantity in the cerebro-spinal fluid; or they may be localized, when they behave in a similar manner to be extradural middle meningeal hæmorrhage. It is a good rule always to suspect a hæmorrhage when anything untoward occurs during the management of a case. A blow on the head may produce a certain degree of cerebral injury, but later, should further signs of injury be evident, it is clear that a further agent is at work, and this agent is usually pressure from hæmorrhage. The clinical observation of the march of events previously alluded to is a more reliable and an earlier indication than the classical signs of vomiting, slowing of the pulse and stertorous breathing, which really indicate serious bulbar paralysis. The diagnosis is made in two steps, though sometimes these are combined. First, the fact of compression of the brain, and, secondly, the situation of the compression should be established. The second step is obviously the more difficult. The nature of the neurological signs and their march, combined with evidence of local damage to the skull (wounds, bruises, or fractures), will usually indicate the side and site of the bleeding. When there is no doubt as to the site of the hæmorrhage a vertical skin and muscle splitting incision may be made, as this gives adequate exposure. If there is doubt, however, a horse-shoe flap should be turned down, giving wider access to the usual sites for hæmorrhages. The possibility of a double hæmorrhage has always to be remembered. The technique for these operations is well known, and only two points need emphasis. Firstly, the routine use of local anæsthetic infiltration, unless contaminated wounds are present. Secondly, the question of opening the dura mater arises. This should not be done unless there is an obvious hæmorrhage underneath it. A nice point arises when there is a compound contaminated fracture with obvious subdural hæmorrhage present. Most authorities here would still advise against opening

the dura mater and would rest content with a large decompression over the area of the hæmorrhage, the risk of death from compression in these cases being ordinarily less than the risk of infective meningitis. These decompression openings usually should not be drained, but each case will require individual treatment. The dura mater, when intact, has a wonderful power of resistance to casual sepsis.

In conclusion, it must be said that no prognosis can be given in any case of head injury until it is reasonably certain the patient is past the risk of intracranial hæmorrhage. The 'unexpected often arrives' is a very true saying in the realm of cerebral injuries, and a 'dunt on the head' may have far-reaching consequences.

The Carotene and Vitamin Requirements of Children

By W. R. AYKROYD

and

B. G. KRISHNAN

(From the *Indian Journal of Medical Research*, Vol. XXIII, 3rd January, 1936, p. 741)

THE problem of the vitamin requirements of human beings is in process of reduction to a quantitative basis. A number of workers have attempted to estimate human requirements of vitamins A, B, C and D in terms of biological rat units, International Units, and of the pure vitamin itself. For the establishment of 'standards of necessary vitamin intake', it is useful to know that a certain intake is associated with deficiency symptoms; 'minimum' or 'optimum' requirements must exceed this intake. The present paper records the association of xerophthalmia in children with a known intake of carotene.

In the course of a visit to certain organized labour camps in the Bellary district of the Madras Presidency, it was observed that a number of children were suffering from 'smokiness' and dryness of the conjunctiva, while a number showed the yellowish foamy patches in the conjunctiva known as 'Bitot's spots'. Evidence of the existence of vitamin-A deficiency in the camps was thereby provided, and a more systematic investigation was undertaken. With the help of an experienced ophthalmic surgeon, 436 children between the ages of 1 and 12 were examined for ocular signs suggestive of vitamin-A deficiency. The results of investigations carried out in three camps were as follows:—

TABLE I
Incidence of xerophthalmia

Number of camp	Number of children examined	CASES SHOWING EYE CHANGES ASSOCIATED WITH VITAMIN-A DEFICIENCY	
		Total number positive	Percentage of number examined
1	62	22	35
2	125	28	23
3	249	66	27
TOTALS.	436	116	27

The children examined were a random sample, and included all ages from 1 to 12. The majority of the positive cases were in the early stages of the disease, showing only dryness, 'smokiness', or wrinkling of the conjunctiva. About 30 per cent of positive cases,

however, were in a more advanced stage, with definite 'Bitot's spots'. Doubtful cases were labelled negative.

At the time of examination the children had been fed for 7 to 8 months on the dietary given in table II. Table III shows its carotene content, indicating the amount supplied by each item of the diet:—

TABLE II
Composition of camp diet as consumed daily by various age groups

Age group	Cholam (<i>Andropogon sorghum</i>) (grammes)	Dhal, arhar (<i>Cajanus indicus</i>) (grammes)	Vegetables and condi- ments (grammes)
1-5	184	14	14
5-8	283	28	20
8-12	311	31	24

with vegetable oil in small quantities.

TABLE III
Carotene content of camp diet

Age group	Cholam (g.)	Carotene (γ)	Dhal, arhar (g.)	Carotene (γ)	Vegetables (g.)	Carotene (γ)	Total carotene (γ)
1-5	184	386.4	14	31.2	14	37.2	454.8
5-8	283	594.3	28	62.3	20	53.0	709.6
8-12	311	653.1	31	68.5	24	63.6	785.2
Average of 3 groups ..							683.2

The carotene content of a sample of cholam used in the camps was estimated in the laboratory by Mr. N. K. De, by the spectrophotometric method recently described. The carotene figures for dhal, arhar, are derived from the spectrographic assay of a sample of dhal, arhar, closely resembling that supplied to the children. In estimating the carotene content of the 'vegetable and condiment' ration, it was assumed that the latter consisted of brinjal (*Melongina solanum*) and bitter gourd (*Momordica cherantia*) in equal quantities, these being vegetables commonly used in the camps; here again, results obtained by spectrographic assay were used. The figures given in this column represent only a rough estimate since we have no exact knowledge of the composition of this part of the ration. But the total condiment and vegetable ration is so small that, whatever its ingredients, it cannot greatly influence the total carotene intake. Average total intake would be increased by about 20% if calculations were made on the assumption that vegetables very rich in carotene—e.g., amaranth and cabbage—were invariably supplied.

Carotene content per gramme of the various items in the diet is as follows:—

Cholam	2.10 γ
Dhal, arhar	2.20 "
Brinjal	0.05 "
Bitter gourd	5.25 "

It may be assumed that the diet was entirely devoid of vitamin A. Spectrographic assay has shown that cholam, dhal arhar, brinjal, and bitter gourd lack this factor. Vitamin A has not been found in a considerable series of vegetable foods investigated in this laboratory.

INCIDENCE OF 'ANGULAR STOMATITIS'

The presence of 'angular stomatitis' (i.e., a raw fissure of about $\frac{1}{4}$ inch to $\frac{1}{2}$ inch at the angles of the

mouth) in the groups of children examined is of interest. Seventy-one children (16 per cent) showed this condition in various degrees. Some of those with eye signs had angular stomatitis also, but there was no definite association of the two conditions. Further study of the possible association between 'angular stomatitis' and vitamin-A and carotene deficiency is required.

No attempt was made to study the incidence of hæmeralopia or of other conditions which have been ascribed to vitamin-A deficiency.

DISCUSSION

Individual physiological variation may account for the fact that only a certain proportion of children in the camps showed positive symptoms. In any population group consuming the same defective diet, signs of deficiency appear earlier and are more pronounced in certain individuals than in others. On the other hand, the physical condition of the children on entering the camps must have shown considerable variation.

The children observed were taken into camps from a district suffering from famine; it may therefore be

inferred that in general the diet previous to admission was extremely deficient in vitamin-A activity. A larger daily intake of vitamin A or carotene would be required to cure symptoms of deficiency than to supply the daily needs of individuals whose livers are well stored with vitamin A. Further Bauman, Rissing and Steenbock have shown that, in rats depleted of vitamin A, and subsequently given large amounts of the vitamin, liver storage of the factor was less efficient than in normal rats, a possible explanation being that vitamin A is poorly absorbed by depleted animals. It may, however, legitimately be argued that a diet which, after being consumed for 7 to 8 months, is found to be associated with xerophthalmia, is deficient in vitamin-A activity, and that 'normal requirements' of carotene are in excess of the amount contained in the diet.

Moore reached the conclusion that equal weights of β carotene and pure vitamin A have the same biological activity. Carr and Jewell found that their richest vitamin-A concentrate was 1.6 times more potent than pure carotene (i.e., the 1932 International Standard Preparation, which is mainly β carotene but contains some α carotene). On the other hand, the work of Booth, Kon and Gillam suggests that the vitamin A present in butter is 6 times as potent as the carotene in butter. According to Kuhn, Brockman *et al.* the α and γ forms of carotene are physiologically only half as active as the β isomeride. It is probable that the carotene in the vegetable diet described in the present paper was present in both the α and β forms, with excess of the latter.

It is difficult to deduce from the present observations, which concern 'sub-minimal' carotene intake, any convincing data as to 'sub-minimal' amounts of vitamin A (*strictu sensu*) for human beings. We have no knowledge as to how far the carotene in the labour camps' diet was absorbed and utilized. According to Clausen carotene is less readily absorbed from

the intestinal tract of children than is vitamin A. Drummond *et al.* observed that, in a case of chylothorax, 'the absorption of vitamin A from the intestine was much more satisfactory than that of its precursor carotene'. It is unjustifiable to assume on the basis of Carr and Jewell's biological assays with pure materials, that 700 γ of carotene in a mixed vegetable diet would possess the same vitamin-A activity for human beings as 450 γ of vitamin A also contained in a mixed diet.

In the almost complete absence of quantitative data as to human needs of the vitamin-A factor, the hypothesis that 700 γ of carotene (roughly 1,200 International Units) represents an inadequate intake for children may be of use in practical dietetics. In the light of the present observations, Salter's estimate that 0.3 mg. (300 γ) of carotene represents minimal daily normal requirements is too low. Optimum human requirements of vitamin-A activity should perhaps be set very considerably above the 'sub-minimal' figure recorded in this paper—in the neighbourhood of 3–5,000 International Units?

SUMMARY

1. Eye symptoms indicative of vitamin-A deficiency were observed in 27 per cent. of a group of 436 children aged between 1 and 12, in a number of labour camps.

2. The diets consumed by age groups 1 to 5, 5 to 8, and 8 to 12, are estimated to contain about 454 γ , 709 γ , and 785 γ of carotene respectively.

3. It follows that optimum requirements of carotene must exceed that of the diets described, and the establishment of a 'sub-minimal' figure of carotene intake, associated with deficiency symptoms, may be of use in practice.

Observations on the Treatment of Acne Vulgaris

By J. C. MICHAEL, M.D.

(From the *Journal of the American Medical Association*, Vol. CV, 3rd August, 1935, p. 327)

Most of us are probably agreed that the therapeutic problem of acne is not yet satisfactorily solved. Now there is a greater tendency to recognize the limitations of therapy and to individualize and select treatment according to each case.

ÆTIOLOGY

A proper approach to the treatment of patients with acne demands a consideration of the ætiology of the condition. This is necessary because the disorder is a syndrome rather than a disease *sui generis*. There are a few investigators who apparently regard acne vulgaris as essentially a local infectious disease of the skin based on a primary seborrhœa, but most dermatologists apparently agree that acne vulgaris is a syndrome in which the influence of one factor, or more likely a number of contributing factors, is of fundamental importance. The proponents of a primary local bacterial causation, despite a great deal of investigation, have still failed to prove their case. Ketron's more recent investigations of *Bacillus acnes* as an ætiologic agent led him to hesitate to ascribe any definite rôle to that organism in the ætiology of the disease. Even in regard to the pustular element in acne, there is not at the present time absolute unanimity of opinion. Of course, most dermatologists attribute suppuration in the lesions to the staphylococcus, nevertheless there is not complete agreement about this feature of the disease, as is evidenced by the recently repeated assertion of Sabouraud that the staphylococcus is not responsible for the pyogenic element in the lesions of acne. This naturally leads to the statement that the entire question should be reinvestigated, since it has a practical bearing on the therapy of the disease.

The second approach to an elucidation of the pathogenesis of the disease, namely, to regard it as a

syndrome, is more in favour. Thus far it has led to nothing tangible; at the most to rather vague generalizations. Needless to say, clinical observation tends to indicate that certain internal factors, such as the physiologic and pathologic activities of the endocrine system and various minor disorders such as anæmia, constipation and foci of infection, play a more or less important rôle in the production of the disease. Whitfield recently discussed these factors and especially emphasized the importance of gastro-intestinal disturbances.

While recognizing the tremendous influence of sexual ripening on the incidence of acne, the dermatologist is still at a loss to explain why acne affects certain adolescents and spares others. Even more elusive apparently is the causation of the acne of adult life in which the hormone factor is not so much in the foreground. In short, while clinical observation has taught a great deal about the disease and its behaviour, an elucidation of the pathogenesis of the disorder is still lacking. A better insight into the ætiology of the disease is, of course, highly desired since the condition is of enormous practical importance.

The primary lesion of acne is the comedo. This is the first appreciable clinical manifestation of the disease. Why does a comedo form? The generally held conception of its formation is that of a mechanical blocking of the follicle by a hyperplasia of the epidermis at its mouth leading to a retention of sebum with an inter-mixture of horny cells from the follicular wall. Whatever the cause of the follicular hyperkeratosis, there can be hardly any doubt as to the primary rôle of this hyperplasia since histopathologic examinations confirm it.

This hyperplasia occurs as a physiologic process during puberty, being part of the activation of the pilosebaceous apparatus by the gonadal stimuli of that period. It may also appear as a pathologic response to exogenous irritation (oil, wax, tar or paraffin) producing the disorder known as oil acne. Accompanying this hyperkeratosis of the follicular ostium there may be and usually is an increased sebaceous secretion, especially in cases of acne vulgaris, but this does not always occur and it is not necessary in the production of comedones. As is well known, a patient with acne vulgaris is occasionally seen whose skin is dry rather than seborrhœic. At any rate, once the comedo is formed, there is only required the element of follicular inflammation to produce the clinical picture of acne. The difficulty, of course, arises as to the explanation of the development of comedones (and acne) in one adolescent and not in another since all are presumably under the same gonadal influence and show fairly uniform responses of the pilosebaceous apparatus in other directions (pubic, axillary and male beard hairs). Kyrle expressed the belief that two possible explanations were conceivable, namely, an abnormal response of the pilosebaceous system in some subjects to the same stimuli, or in some cases an abnormal supply of hormone or other stimulus. Sulzberger, Rostenberg Jr. and Sher followed the same line of reasoning. In a preliminary way they endeavoured to ascertain whether there is a follicular hypersusceptibility to one or more of the possible irritants. Their preliminary investigations showed negative results but of course do not invalidate or weaken the hypothesis. Stein advanced the hypothesis that acne vulgaris is caused by an irritation of the follicular wall by the elimination of metabolic products of the gonads and of substances absorbed from the intestinal tract. He quoted Blaschko as seeing the analogy in this process between true acne and acne artificialis caused by bromides.

In regard to the fundamental change, namely, the hyperkeratosis and epidermal hyperplasia that underlie the formation of comedones, an interesting and perhaps significant chemical interplay comes to mind. In the experimental production of cancer use is made of tar or tar fractions (carcinogenic compounds) which when rubbed on the skin of a laboratory animal regularly produce cancer in a certain length of time. These substances operate by producing epidermal hyperplasia.

Similarly, the acnes caused by greases, tar and oil that reach the skin from without (occupational oil acnes) are apparently produced by the primary irritation of the follicular ostium and wall. The carcinogenic compounds are known to have a phenanthrene nucleus and this substance is also present in coal tar and many greases. It is striking that the phenanthrene nucleus is found in both the male and the female sex hormones, which are closely related chemically. It seems more than a coincidence that the phenanthrene nucleus should be so closely connected with pilosebaceous hyperplasia and irritation. This thought may serve a useful purpose in further investigations on the pathogenesis of acne vulgaris.

The approach to the elucidation of the causation of acne by clinical studies has produced some interesting observations, but unfortunately nothing that can be said to represent a fundamental advance.

Among these newer contributions the investigation of the late Bruno Bloch revealed the great frequency of acne. Bloch and his collaborators examined 4,191 school children between the ages of 6 and 19 (about equally divided as to sex) for the presence of acne vulgaris. Various degrees of the disorder, from a few comedones to true acne with papules and pustules, were tabulated. Their investigation showed that approximately 64 per cent of the children were affected with at least a few comedones. Of true cases (severe enough to be considered a disease) there were 8 per cent among females and 20 per cent among males. The preponderance of males in all the degrees of the disorder was definite and may have some pathogenic significance.

Without going into further details in regard to Bloch's observations it may be said that the well known observation of the chronological relation of acne and puberty was substantiated. So frequent was some manifestation of acne found among these adolescents that Bloch concluded that the disorder must be based on a physiologic condition, and that it is unnecessary to invoke a pathologic substratum for the disease. In short, Bloch concluded that those elements that are almost taken for granted as important contributory factors in cases of acne, namely, constipation, anemia and menstrual disorders, are certainly not responsible for the disease among juveniles (his researches did not include acne of adult life). Apparently alone among earlier writers, Politzer stated this same belief on the basis of his clinical observations.

In America the study of Cunningham and Lunsford deserves particular comment since it comprised an older group of subjects (women college students) than Bloch's. These investigators compared 2,974 young women with acne with 3,185 control students with regard to the incidence of constipation, colds and other infections, and the condition of the thyroid gland, nose and tonsils, as well as the menstrual history. There was practically no difference between the two groups in respect to the incidence of these systemic disorders to which a contributory influence on acne is so uniformly ascribed. The conclusion to be drawn from this study is that these disorders apparently have little or no influence on the incidence of the disease. But for the present, judgment on this conclusion must be reserved since the question of an inherited predisposition obtrudes itself and cannot be definitely evaluated, though it is probably of some moment.

As has happened so often before, biochemical studies have given no further insight into the pathogenesis of the disease. Greenbaum's investigations of tolerance to dextrose led to nothing significant, and Strickler and Adams' somewhat different approach to the question of sugar metabolism in cases of acne led them to deny any influence of sugar metabolism on the disease. The same authors found no aetiological indications in the cholesterol metabolism of patients with acne. Knowles and Decker and recently Immerman sought to throw light on the aetiology of the disease by means of gastric analysis but found nothing of significance.

Ramel's investigation of the deep nodular form of acne vulgaris led him to the conclusion that this type is of tuberculous origin. This will hardly be accepted

without further corroborative evidence, which, at most, was only partly given by von Kemer's report of the therapeutic benefit derived from the removal of foci of infection and subsequent tuberculin treatment. Of fifty-two patients twenty-two recovered after the removal of pyogenic foci, and all but three eventually were cured after subsequent tuberculin therapy.

INFLUENCE OF ENDOCRINE DISTURBANCES

Of especial interest at present are the recent studies of female hormone disturbances associated with acne vulgaris in which the newer methods of detecting the presence and amount of these substances in the urine has been employed.

Deseau and Guillaumin used the interferometric method of Hirsch in a small series of patients selected because an endocrinopathy seemed to be a factor. The results confirmed this surmise as in each case an endocrine disturbance was indicated by the test. Measures taken to combat the disorders led to beneficial therapeutic results.

In this country Rosenthal and Kurzrok appear to be the only investigators who have attempted a clarification of the problem of acne by hormone titration. They determined the presence of estrogenic substance in the urine of thirty-four patients with acne. Though estrogenic substance is normally found in the urine during the active sex life of all women, it was absent in twenty-seven of the patients, in normal quantity in six and in small quantity in one.

Along the same line is an interesting and optimistic report by von Leszczynski and Liebhart on the therapeutic results obtained in cases of acne when based on hormone tests. These authors expressed the belief that acne may rest on a physiologic basis in early years but that acne in early adult life and later years is the result of a pathologic condition. Their patients were studied carefully for systemic disturbances, and tests for hormone function and presence were carried out as thoroughly as possible. For the determinations of estrogenic substance and the anterior pituitary-like principle from the urine of pregnancy, Zondek's methods were used. As a consequence of these studies they concluded that it is possible to divide patients with acne into three aetiological groups. The grouping is based partly on certain clinical characteristics of the disease and partly on the results of endocrine and general studies. So-called pure types of cases are not common. The three types of acne are as follows:

1. *Acne sexualis*.—In pure cases it is limited to the face, especially the cheeks and chin. Seborrhœa is slight or absent. Menstrual disturbances are usually present and exacerbation of the acne nearly always occurs during menstruation.

2. *Acne intestinalis*.—This type has a predilection for the trunk. A seborrhœic condition usually in moderate degree is nearly always present. Constipation of the atonic type, visceroptosis and colitis are frequent. These cases are based on intestinal stasis.

3. *Acne thyreogenes et seborrhœica*.—This is a severe type in which large papulopustules as a rule affect all the usual regions. Kerosis is common. Enlargement and hyperactivity of the thyroid gland is frequently associated.

Identification of these types may require both clinical and detailed laboratory study. According to the authors recognition of these aetiological forms is absolutely requisite for the best therapeutic results. They did not use roentgen therapy but considered local applications to be important. The internalistic and endocrinologic outlook of these authors is stimulating. Their therapeutic results, contained in a report of fifteen patients, were apparently excellent.

Recently Van Studiford reported some interesting therapeutic results based on opotherapy.

For some time in selected patients I have made an attempt to utilize the newer knowledge of female hormonology in the therapy of acne vulgaris. In years past the crude extracts then available were occasionally employed but without any encouraging results. Since the availability of the newer endocrine products, I have

worked in co-operation with gynecologists in an endeavour to employ these preparations in the most exact manner possible. The selection of suitable patients has been first made by me and the selection of hormone therapy by the gynecologist after a study of each patient from the special point of view. In this way twenty-six females have received what may be considered as reasonably good opotherapy. Up to the present the therapeutic results have been poor and discouraging so far as the influence of the hormone treatment on the acne is concerned. I have seen a number of instances of improvement or even complete relief of menstrual disturbances without corresponding benefit of the acne. It should be mentioned, however, that the studies of the individual case prior to the institution of glandular products in no way approached the thoroughness of von Leszczynski and Liebhart so that the type of therapy in some cases may have been ill chosen. My present opinion in regard to this phase of the therapy of acne is that theoretically it is enticing, but that practically, for the present, it is of slight value.

ULTRA-VIOLET RAYS, VITAMINS AND BACTERIAL PRODUCTS

Butler reported highly satisfactory results with ultra-violet rays. He did not give any figures but stated that relapses were frequent. Louste and Juster likewise reported favourable effects with this method after a year's experience. Andrews spoke favourably of it. A few physicians have used it conjointly with the roentgen ray, but this combination is not considered desirable by most dermatologists. Ultra-violet therapy has the great disadvantage of requiring a dose of some degree of erythema (sufficient to cause at least moderate desquamation) to produce favourable effects. For this reason I have used it in only a few instances in which the acne has been resistant to other measures and in these cases unsuccessfully.

On the whole, ultra-violet radiation plays a subordinate rôle in the therapy of patients with acne.

In a brief note Doktorsky and Platt recorded definite clinical improvement in patients with pustular acne following the administration of vitamin D. My own experience with this preparation in eleven patients ranging in age from 14 to 22 years was not encouraging. My patients were all undergoing other forms of treatment at the same time but did not seem to respond any faster to this therapy than if vitamin D had not been administered.

Years ago, Fox reported on the use of vaccine therapy and concluded that it was practically useless. This appears to be the generally accepted opinion at present, though an occasional patient with the pustular type of acne seems to respond to vaccine treatment. Staphylococcus toxoid, which was valuable in Dolman's hands, was unfavourably reported on by Kindel and Costello and Cornbleet and Rattner. Bacteriophage, though found to be of value by Blum and Peyre and Alderson, was ineffective in Crutchfield and Stout's experience.

ROENTGEN THERAPY

As is so well known, for many years the roentgen ray has been the dermatologist's chief weapon in the attack on acne. The action, technique and dangers of this physical agent are too well known to require description here.

In the earliest report in this country the results achieved were extolled and there followed a series of articles confirming this pioneer's enthusiasm. With the development of the technique of exact dosage, the roentgen ray became the trained dermatologist's most commonly used method. So enthusiastic were the earlier reports that for years there was a general impression that little more than a proper knowledge of the use of the roentgen ray was required for the successful therapy of patients with acne. Earlier reports and impressions were that from 90 to 95 per cent of the patients were permanently curable in about four months. The treatment became almost stereotyped and aside from more or less casual directions about

diet, routine correction of constipation and standard tonic regimen when obviously indicated, roentgen therapy was wholly depended on to produce satisfactory results.

Missgivings about this apparently successful therapeutic method led me to investigate the end results obtained in a series of about 200 cases. This series, while too small to warrant the drawing of definite conclusions, showed trends which were obviously at variance with the commonly accepted belief of the efficacy of the roentgen ray. Since my report, those of Lord and Kemp and of MacKee and Ball have appeared and have confirmed what was indicated in my personal experience. In the main, these three reports agree. Lord and Kemp, however, did not, like myself, find that recurrences in the period of puberty and the immediately following years were so frequent. MacKee and Ball, however, confirmed my observations on that point. The figure for recurrences in patients up to 18 years of age found by me was 47 per cent after the first course of treatment, and after the second course (maximal permissible roentgen therapy) was 22 per cent. Thus, approximately half of the patients had a relapse and in one-fifth there was ultimate failure. Of the patients up to 25 years of age, 35 per cent had a relapse after the first series of treatments and 12 per cent after an additional series. MacKee and Ball did not report their recurrences by age groups but stated that relapses were frequent among the younger patients.

Despite this frequency of relapse, it should be stated that the roentgen ray is a dependable agent and is curative in a vast majority of the cases of acne, the final successes approximating 80 per cent. It can be depended on to clear up the lesions in practically all cases in a period of from three to five months. In principle, therefore, if the necessity arises to eradicate the lesions, the roentgen ray may be depended on to do so with a remarkable degree of certainty. Unfortunately, as previously noted, this certainty of temporary cure is not followed sufficiently often by permanent freedom to be entirely satisfactory.

COMMENT

From the foregoing observations it is obvious that the treatment of patients with acne cannot be stereotyped if the best results are to be obtained. The choice of the therapeutic attack is a matter of analysis of the individual case. For the purpose of this analysis the important questions to be taken into consideration are (1) the information obtained by a history and systemic examination (foci of infection, anaemia, diet, gastrointestinal function), (2) the age of the patient, (3) the mildness or severity of the case and (4) the endocrine factor, if determinable.

As to the first group of contributory causes (anaemia, constipation and so on), it goes without saying that they should be taken care of according to general medical principles. The dietary regimen deserves special mention since there is no unanimity regarding the importance of diet in the disease. Apparently some physicians neglect it completely. Urbach stated that there was no scientific evidence which indicated the type of diet that should be effective in the disease. Stokes thought it of great importance and of valuable therapeutic assistance when carried out in the detail comparable to that in cases of diabetes. The type of diet best suited to the patient with acne is generally agreed on and need not be detailed. Every textbook contains a practically similar list of interdicted and permissible substances. In a former study I could not find that diet played any apparent rôle in the results obtained, yet it is unquestionable that in individual cases diet seems to be provocative of outbreaks and in some instances the breaking of dietary instructions has been followed by relapses in seemingly cured patients. White reported a series of cases in which specific sensitivity to foods produced outbreaks of acneiform lesions. These cases should not be confused with those of true acne, since he expressly stated that comedones were not present.

The same line of thought applies to a focus of infection; its presence may render therapy unavailing in some instances, while in others it seems to have no influence on the course or response of the disease.

In regard to the mildness or severity of the case, the important point is whether or not scarring is being produced. In some of the mild cases (judged by number of lesions) each lesion produces a small pit that in the aggregate becomes of considerable concern to the patient. If, on the other hand, the disease is mild and not causing scarring of any moment, a campaign of local therapy and general measures can be followed with more equanimity by the patient and physician than if the lesions are numerous, unsightly and producing large permanent scars. Under the latter circumstances the therapy that promises to control the disease in the shortest possible time is indicated.

The age of the patient is one of the most important considerations in a choice of therapy. This personal opinion is based on the conviction (supported earlier in this paper by reference to recorded experience) that age is the most important element in the prognosis, especially when roentgen therapy is used. When that method of treatment is depended on for cure, about half the patients under 18 years of age have a relapse. Since the treatment consumes time and is somewhat expensive, the number of failures leads to considerable dissatisfaction. It has therefore been my practice for some time to withhold roentgen therapy from all patients under 18 years unless there has been absolute failure of response to other measures and marked scarring is being produced. In short, in juvenile cases of acne roentgen therapy is hardly ever used. It seems to me best to treat these patients persistently with local applications of a stimulating and astringent type and by all known measures of influencing the disease through the general system to keep the disorder at a minimum. Under such a regimen the patient must be apprised at the beginning of treatment that cure is not anticipated, that a long period (probably of several years' duration) of therapy is required and that only in the event that the disease is causing pronounced cosmetic difficulties will roentgen treatment be administered. The recent article by Nichols demonstrated that such a method is attended by satisfactory results, to which I can testify from an extended experience. The success of this programme is dependent in no small degree on the psychologic influence of the physician.

On the other hand, in patients from 18 to 22 years of age irradiation is probably the method of choice. Relapses are less frequent than in the earlier age group and in instituting roentgen therapy one is in many cases but aiding and anticipating the natural tendency of the disease to disappear about this time of life. For this reason, I use irradiation practically as a routine measure for patients who are in this age group if the severity of the disease justifies it.

Patients in the middle twenties and older, however, present a somewhat different therapeutic problem. In many cases the disease has continued since adolescence, in others it begins in this relatively late period. Among the former are many cases in which the endocrinal upset initiated by puberty has not been adjusted normally; while in others, systemic disturbances (pelvic disease, gastro-intestinal disorders) appear to be primary ætiologic factors. Proper management in this group must comprise an industrious search and eradication, if possible, of all suspicious contributing factors. Among these patients, in my experience, are found a large number that fall into the intestinal type of von Leszczynski and Liebhart. Radiation therapy apparently is more helpful to these patients than to the younger ones. It is a poor policy, however, to depend on it rather than to make a diligent effort to ferret out and attack the many possible and important contributing causes.

CONCLUSIONS

1. Acne vulgaris is a syndrome the cause of which is a complex of various interacting factors. In juvenile

patients the physiologic activity of the gonads appears to be the most important factor. In older patients minor functional and organic disorders apparently (but not indisputably) play a definite rôle in the causation.

2. The recent tendency to depend less on roentgen therapy and more on general and local measures should be encouraged. While the roentgen ray is the most certain means of eradication of the lesions, recurrences are too frequent to make this treatment entirely satisfactory.

3. In juvenile patients recurrences are especially frequent and for this reason it is believed that the roentgen ray should not be used except under unusual circumstances.

4. For older patients, especially those between 18 and 25, roentgen therapy is the method of choice. It should be supported by an industrious search for and attention to any probable ætiologic factors.

The Modern Treatment of Surgical Shock

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(From the *Journal of the American Medical Association*, Vol. CV, 30th November, 1935, p. 1731)

THE subject of traumatic shock is perennial; like our poor relations it is always with us. It has provided a veritable storehouse of controversy. Theories as to the causation of shock as advanced even to-day and championed so vigorously are such that many of the papers on this subject have the tenor of a debating society about them. And yet the condition we know as shock was known to the ancients although not designated by this term until 1795, when James Latta so termed it. In dealing with a subject on which so much thought and experimentation have been expended, it is of particular interest to look back a few years to find out what was known of the subject a generation ago. Fifty years ago that peer of surgeons D. Hayes Agnew discussed shock, and many of his observations appear quite modern. The symptoms associated with shock as observed by Agnew are much the same as they are known to-day. Agnew defined shock as a 'term used to express the collective phenomena which follows the infliction of some violence to the body through the nervous system'. The causes of shock were classified as psychical and physical.

Just how much actual shock can be produced by psychic trauma is difficult to say but every physician has seen patients who have responded to an apparent psychic injury by the symptoms of mild primary shock. I recall the case of a sturdy man who came to the operating room with his blood pressure so low that operation had to be deferred and restoratives given. Later I found the cause of his dilemma. A substitute orderly had prepared him for operation, and in the conversation that ensued the patient was told by the orderly that he was going to have an operation from which he had seen no one recover.

Shock was expected in Agnew's day, just as it is to-day, to follow severe physical trauma. For the treatment of shock Agnew advised placing the patient in the recumbent position with the head low, with the application of external heat and blood transfusion if there had been loss of blood. In cases in which there was engorgement of the right side of the heart, bleeding was to be resorted to. Stimulants were to be carefully given, brandy and whisky by mouth, subcutaneously or by rectum.

But the concept of the mechanism of shock has been changed since Agnew's day. Agnew quotes Mitchell, Keen and Moorehouse, who made their observations during the Civil War and who felt that the medulla and the pneumogastric nerve were chiefly concerned in initiating the condition of shock, but he himself felt that the central factor in shock was more widespread. Agnew accounted for the pooling of blood in the 'deep venous trunks by associating together feebleness of the heart and paralysis of the walls of the blood vessels'. He did not hit far amiss of the mark. The fall in

temperature Agnew explained on the basis of a temporary arrest of tissue metamorphosis. To-day, in spite of the more accurate data concerning the state of the organism during the condition termed shock there is no unanimity of opinion as regards the actual mechanism of the initiation of the condition.

I shall review hastily some of the various theories regarding the cause of shock. Crile's theory that the marked physiologic and nervous depression associated with shock is the result of exhaustion of the vital nerve centres received widespread attention until it was shown by Forbes and his co-workers that the changes in the central nervous system were the result and not the cause of shock. In addition, Dolley, Janeway and Ewing and Cannon produced evidence to discount this theory. Notwithstanding the mass of evidence against this theory, it is occasionally reviewed. O'Shaughnessy and Slome in January 1935 published data on experiments on traumatic shock and discussed their data in relation to Crile's theory.

For a time Yandell Henderson's theory held a prominent place in all discussions on shock. Henderson believed that the loss of carbon dioxide from the body was the initiating factor in shock; closely allied with this view was the question as to whether or not acidosis might be the factor of prime importance in shock. The effect of the loss of carbon dioxide by hyperventilation and its relation to shock was studied also by Janeway and Ewing, and Mann studied the effects of a possible loss of carbon dioxide through the opened abdomen. But experiments indicate that the loss of carbon dioxide is not the cause of shock. As regards the relation of acidosis to the cause of shock, the experiments of the Medical Research Committee showed that a marked acidosis could be produced by the injection of acid without producing shock.

Following the work of Dale, Laidlaw and Richards on the relationship between histamine and shock, a theory was advanced that shock was caused by the liberation of toxic substances generated at the site of the injury. Histamine or histamine-like substances were known to occur in injured tissues, and varying degrees of a shock-like state could be produced by the injection of histamine. Cannon and Bayliss found that when a cat's thigh was traumatized shock did not result if the blood supply to the extremity was excluded, even though the nerve supply to the limb was intact. That toxæmia *per se* was not the cause of shock was suggested by the work of Parsons and Phemister, who injected the blood drawn from the femoral veins of the traumatized limb of dogs and reinjected this material into normal animals without producing shock.

Recently Freeman has postulated that the phenomena of shock may be explained on the basis of hyperactivity of the sympathetico-adrenal system. By the repeated injections of epinephrine he was able to reduce the blood volume in animals, a fact previously established by Gasser, Erlanger and Meek. In addition, Freeman caused a reduction in blood volume by the initiation of 'sham rage' in cats in which the cerebral cortex had been destroyed. With associated paralysis of vasoconstrictor fibres by ergotoxine or after a complete sympathectomy, injections of epinephrine or 'sham rage' did not cause a reduction of blood volume and shock did not result.

Speaking still of recent theories advanced for the causation of shock, Swingle and his associates stated that the manifestations of surgical shock and deficiency of the adrenal cortical hormone were similar, and they thus proposed the use of adrenal cortical extract in the treatment of shock. Since shock and a deficiency of the adrenal cortical hormone are not related, it is apparent that this theory adds nothing of value to the treatment of shock. Furthermore, the adrenal cortical extract has a slow, prolonged action and, if used in the treatment of shock, its effect will not be manifest until it is too late to meet the emergency.

When so many theories are advanced for the explanation of a condition, it is generally conceded that no one theory can be accepted. This naturally does not preclude the possibility of finding some truth in any

one or in all the theories. But the theories cited have provided facts that may be used to advantage.

During the World War the problem of traumatic shock naturally again came to the forefront. Some advances both in its prevention and in its treatment were made, but under the stress of military emergencies conditions for experimental work and careful observation were not always of the best. The large number of cases seen by the military surgeon in combat in a short time could not be duplicated in civil practice even in the most active traumatic surgical service. Despite the tense situation of the World War, valuable contributions were made, and the publications on shock by the Medical Research Committee, the combined observations of both British and American medical officers, are of outstanding interest.

Following the Armistice the study of shock from the experimental standpoint was revived. This included not only a critical analyses of existing theories but an attempt to determine the conditions that prevailed in the organism during traumatic shock. It is in this respect that the postwar study of shock has excelled and, despite the controversial points relating to the nature and cause of shock, certain phenomena are now recognized and accepted.

Unquestionably the most striking phenomenon associated with traumatic shock is the decrease in blood volume and the loss of the fluid elements that eventuate in a concentration of the corpuscular elements. It has been assumed, following the work of Dale, Laidlaw and Richards, that the loss of fluid is due to a change in the permeability of the finer vessels of the circulatory tree. In traumatic shock the plasma proteins fall in spite of the fact that the concentration of the hæmoglobin increases. One must therefore assume that in this condition the plasma proteins pass from the blood into the intercellular fluids and, as a result of their osmotic effect, draw an additional amount of fluid from the circulation. Acknowledgedly every injury to the tissues is followed by local changes in the circulation. When the injury is severe not only fluid but the cellular elements of the blood gain access to the tissue spaces, and when this transudation is severe enough there occurs a change in the blood volume. Do not these observations adequately explain the reduction in the circulating blood volume and the consequent fall in blood pressure? When the blood pressure or blood volume falls to a critical level, further transudation of fluid from the vessels takes place and the plasma proteins and blood volume decrease simultaneously. Hence in recent years we have come to consider shock as due solely to the loss of fluids into the tissues outside the vascular system.

Freeman noted that dehydration stimulated medullo-adrenal secretion and like injections of epinephrine reduced blood volume. He maintained that arterial constriction rather than dilatation better explained the phenomena of shock. Arterial constriction tends to slow the blood stream and in turn would lead to stasis in the capillaries and the escape of fluid and protein with its attending reduction of the blood volume.

But regardless of the mechanism, the loss of blood volume is a definite reaction to tissue injury and must be reckoned with in treatment. To be sure, fear, anxiety, pain, cold, dehydration and fatigue are contributing factors.

The restoration and maintenance of blood volume may be accepted then as of basic importance in the treatment of shock, and the problem of treating shock is inseparably connected with the maintenance of blood volume. When the degree of shock is severe, no matter what the theories, any or all of the methods of treatment may fail. Paradoxically, it may be said that the time to begin the treatment of shock is before its onset. As preventive measures one must consider the alleviation of pain, of fear and of anxiety. It has been suggested that shock may be relieved by spinal anaesthesia, even though the blood pressure is already low. Spinal anaesthesia would of course relieve pain, but it is questionable whether it is wise to introduce

an additional blood pressure lowering agent in shock, even though certain experiments on animals are reported in which a low blood pressure rose following spinal anaesthesia. Morphine is a valuable adjunct to other forms of treatment and prompt attention to the source of painful stimuli is important.

In the treatment and prevention of shock the prevention of psychic trauma too often is overlooked. Intangible as the factor is, I can best illustrate what I mean by recalling the value of what is termed 'vocal anaesthesia' in conjunction with spinal or local anaesthesia. Not only do patients whose mental processes are diverted from the disconcerting ordeal complain less about the operative procedure, but in the case of spinal anaesthesia, in which a fall in blood pressure is not unusual, there is stabilization of the pressure. The ability to distract the patient's attention in the treatment of shock is of value in the alleviation of pain. Reassurance to the patient by different means is helpful and taxes the resources of the surgeon.

Lowering the head of the patient and the application of external heat have long been known and accepted as routine procedures.

But if one recognizes the loss of blood volume as the essential aetiological factor, the restoration of blood volume must be acknowledged as the predominant and indispensable agent. In mild shock, intravenous therapy at times causes an immediate relief of symptoms. However, if the patient is losing fluid from the blood stream rapidly and continuously the addition of more fluid is of little service unless the solution can be kept within the circulation. Adequate circulation can be maintained for a short period of time by the introduction of a solution of 10 per cent dextrose and physiologic solution of sodium chloride, but there is need for a solution that diffuses less rapidly. For this reason blood is more efficacious; but if blood is not readily available an acacia solution may be substituted.

During the World War acacia was suggested as a substitute for blood in the treatment of shock by the British physiologist Bayliss. At that time the difficulty of obtaining a pure preparation discouraged the use of acacia and it was almost universally abandoned. To-day, however, reliable preparations of acacia in ampules are on the market and may be used without fear of harmful reactions. I have employed this agent where there was need for the rapid restoration and maintenance of fluid volume and have seen no ill effects when it was given in proper concentration. Acacia has again come to the fore in that it is available in stock and convenient containers.

For a time during the World War it was thought that, since there is an associated acidosis in shock, solutions of sodium bicarbonate might be given intravenously to some advantage. Cannon treated several soldiers by this method and was able to cause a transient rise in blood pressure, but this method of treatment was short-lived. It has, however, during this year been revived by Coonse and his associates. It is sufficient to say that the use of a sodium bicarbonate solution is not without danger should it cause an uncompensated alkalosis. In fact I can see no particular advantage in bicarbonate solutions when the same results may be obtained by the much less dangerous physiologic sodium chloride and dextrose solutions.

Recently my attention has been called to the beneficial effect of 10 per cent ethyl alcohol in 10 per cent dextrose given slowly, and this I have employed to advantage. As much as 2 litres may be given intravenously in twenty-four hours. Patients receiving this solution experience a feeling of warmth and well-being. Alcohol in the form of whisky or brandy has long been considered valuable for its stimulating effects and, in addition to its stimulating effects, affords easily available calories.

It must be admitted that during the postwar period definite advances were made in that there was a more accurate understanding of the phenomena of shock, although the mechanism is still not well understood.

How may the treatment of shock be summarized? Primarily, in the removal of all contributing causes.

These are not only associated with physical trauma but include psychic, nervous and humoral aberrations. I am not unmindful of the effect of pitressin in maintaining blood pressure and of the stimulating effect of caffeine. But above all these I would emphasize employment of agencies to maintain blood volume. These include saline and dextrose solutions, dextrose and alcohol solutions, solutions of acacia and last, but not least, blood transfusion.

Finally, what is the difference between the treatment of shock in civil life and that in military engagements? It is acknowledged that the treatment of shock should begin at the earliest possible moment, and the treatment of shock in war time is a matter of organization. How much treatment can be carried out at the first aid stations and how promptly can the injured be transported to field hospitals? These are problems that must be left to the military surgeon, who must keep constantly before him the importance of the avoidance of every unnecessary delay in applying the essential remedies.

The Treatment of Acute Frontal Sinusitis

By T. B. LAYTON, D.S.O., M.S. (Lond.), F.R.C.S. (Eng.)
(From the *Lancet*, Vol. II, 14th December, 1935, p. 1345)

THE treatment of acute frontal sinusitis should be purely medical. First let the bowels be emptied. My grandfather used a blue pill and a black draught which he called 'a birch broom and a bucket of water'. I prefer castor oil because of its certainty of action and because it leaves the patient costive for a while. Once the gut has been emptied it may be left to itself till the invasive stage of the acute infection has passed. It is the small intestine that needs to be emptied, and a full colon or an isolated scybalous mass may prevent this. It is then that a skilled nurse should be called in. She should be able to deal with it within a limit of 48 hours. It is sometimes difficult to persuade those who are in attendance on the patient of the need for the brisk purge when he or she has 'taken something' or 'always looks after that'. The little dose of salts or senna should be neglected and the emptying process started afresh.

The next point is position. The ordinary method of propping a patient in bed is never effective. While he is upright a shortness of the hamstrings may make the position a cause of discomfort or even of pain. To relieve this he bends the hips and knees and shortly sinks down. He then lies upon the lower part of his chest inhibiting movement in this region and thus diminishing the air-entry into the bases of the lungs. If the patient is nursed in bed he needs a pillow under the knees lashed to the head. Better is it to let him be in an armchair. The idea of nursing a patient 'in bed in an armchair' is a difficult one to get into the minds of medical men, and still more into those of the nursing profession. Yet it may be remembered that Hajek kept all his patients after the septum or a sinus operation in this position for 48 hours; and that in acute infections Sydenham, who practised before Clifford Allbutt had invented the clinical thermometer and therefore dealt with 'fever' rather than with 'pyrexia', constantly warns us that 'the patient should sit up at least some hours every day, much experience having shown that this is of singular service'; or advises him 'to keep his room without lying always in bed'. Personally I would not even keep the patient in the armchair but leave him some freedom to move about. He can then use a commode or, if the house be warm, go to the closet and thus be spared the agonies of the bed-pan. However the patient is nursed there is a small point that needs attention. The head must be in a position slightly flexed, but this must not be sufficient to cause the slightest obstruction above the clavicle. It is remarkable how easy it is for some slight pressure to happen on the jugulars, and this results in a great increase of the headache. Further, the head must be so retained by pillows that the

patient does not have to use the muscles of the neck to balance it in this position. I would not mention this point did I not see it so often neglected.

The room must be warm but well ventilated, of an even temperature, and I believe that it is better when the atmosphere is moist. I suspect that we have neglected a valuable remedy in giving up the bronchitis kettle for this complaint.

We come next to diet. The most important factor is the fluid. I demand that my nurses should get 300 ounces into an adult in a severe case. This will not be effected without personality on their part as well as perseverance and a set organization. I have described elsewhere how this may be done. The fluid usually given is fruit juice and water with sugar or glucose added, and the latter then provides a considerable caloric value; but to some it is a sickly drink and efforts should not be made to compel it against the patient's wish. Plain water is better than no fluid. The use of rectal salines should not be necessary in this complaint and are disturbing to the patient, who should be kept at rest except when movement is voluntary. Food should be given as well, and if he will the patient may take anything. It is a good sign. Probably a light farinaceous diet is all that he will feel inclined for with perhaps boiled fish and potatoes. The diet should include some roughage to begin to replace that which has been lost.

That is all the treatment that is necessary. Two other things may be considered, drugs and applications to the nose. I am opposed to any attempt to bring down the temperature artificially by any medication. Again to quote Sydenham: 'The fever itself is no other than the instrument of nature, by means whereof she separates the vitiated parts of the blood from the serum'. The use of salicylates prolongs the convalescent period, is lowering to the patient, and likely to result in the inflammation passing on to the suppurative type that needs prolonged treatment possibly of an operative nature after the patient otherwise is well. Pain is the great indication for medication, and a small dose of aspirin may relieve this in a slight case. In the severe type however where pain is acute it is better to be certain of its relief by an injection of morphia, or if it is continuous to keep it under by a mixture given every four to six hours and containing four or five drops of laudanum according to the need.

Locally it is the custom to apply to the mucous membrane of the nose cocaine and adrenaline, or more fashionably to-day ephedrine. I have given these up. I cannot say I have known them to do any harm, but cases do as well without, and I believe they cause the mucous membrane to shrivel but slightly for a short period and to swell the more for the rest of the time intervening before the next application. The only indication for nasal medication is that the patient expects it, and then some mild menthol ointment (0.5 per cent) placed within the nostril is the best because the least disturbing. So also I have given up washing out the maxillary sinus, it is distressing to the patient. A perfection of anæsthesia cannot be obtained in the inflamed state of the mucous membrane, and I have not found it of value in this acute stage. The removal of the front end of the middle turbinal which I have done in the past I now believe actually to be dangerous. When the patient is in hospital, with the appliance at hand, the use of a light bath to the head seems to be of value if the patient likes it; but if it be objectionable to him it should not be pressed; nor would I have the patient admitted especially for this. In his own home which combines the elasticity of movement and rest in the upright position that I have discussed above the patient is best if the nursing is possible that is needed in a severe case.

There remains to be discussed the question of inhalations. These are undoubtedly of value once there has occurred a passage through the nose. It is my practice in hospital to alternate the hot-air bath with a menthol inhalation. I have no evidence that this is better than the older Friar's balsam.

We may then sum up the treatment of acute sinusitis, of which the involvement of the fronto-ethmoidal cells is but a part, by saying that there is no room for surgery and that the medical treatment is the minute attention of a hundred details, many of them of the most homely nature, rather than the exhibition of any specific drug or therapy.

The Clinical Features of Coronary Disease

(From the *Canadian Medical Association Journal*, Vol. XXXIV, March 1936, p. 319)

CORONARY disease produces anatomical changes of a serious character both in the coronary arteries themselves and in the muscle which they supply. It is an insidious process, taking years for its full development. For long there may be no clinical manifestations, or these may be so trifling that they are disregarded, until attention is riveted upon the condition through the occurrence of angina pectoris or the manifestations of coronary occlusion, the latter an event which usually presents itself with dramatic suddenness. In the early stages, and for a long time, while the major coronary trunks may be involved, the pathological changes, so far as immediate results, at least, are concerned, chiefly centre about the finer, arteriolar, ramifications and their immediate neighbourhood. This means a steadily increasing starvation of the cardiac muscle from diminution of its blood supply, resulting in atrophy of the muscle fibres in many scattered areas and their replacement by fibrous tissue, a structure that has no contractile value. Thus we get what is commonly called 'chronic degenerative myocarditis', a faulty term, as the condition is not inflammatory. The grosser changes in the main coronary trunks take longer to produce their effects, but result in loss of elasticity and contractility followed by narrowing of their lumina. Infarction of the heart wall, usually from thrombosis, is the last phase, very often.

The clinical manifestations of coronary disease are very variable, depending on the stage at which the morbid changes have arrived, the extent and position of the lesions, and the amount of reserve power of the heart. At first they may be slight, the patient noticing only that he has a little shortness of breath or some disagreeable palpitation on a degree of exertion that had previously caused him no inconvenience. His disability may increase until we get definite evidences of heart failure—urgent dyspnoea, a dilated heart, œdema of the lungs, dropsy, congestion of the liver—one or more of these. This is, *a priori*, only what we would expect. Frequently there has been hypertension also. Pain (angina pectoris) may or may not have been complained of at some time previously. Here may we interpolate a protest against the common practice of discussing 'angina pectoris' as if it were a disease entity rather than a symptom, like any other pain. There are excellent reasons for maintaining our view but we cannot enter into them now. Oille and Rykert follow a common practice of dividing the clinical manifestations of coronary disease into three groups—chronic degenerative myocarditis, coronary occlusion and angina pectoris. They state that in 20 to 25 per cent of cases of angina pectoris nothing can be found wrong with the heart. This, we presume, refers to the physical examination. It would be unsafe to conclude from this that the heart is normal in angina pectoris. In fact, the evidence points the other way. Moritz and Beck in a report on 94 cases of coronary occlusion note that 14 of the patients suffered from typical Heberden's angina; in every one of these they found coronary sclerosis and myocardial fibrosis. Angina pectoris of the true Heberden type undoubtedly means organic disease of the myocardium, with the rarest exceptions. As time goes on, if the subject of coronary disease does not succumb to cardiac failure, he may or may not suffer repeated anginal attacks, but eventually will develop coronary occlusion. The well-recognized manifestations of this last condition are the following:—severe persistent pain in the chest, lasting for a

few hours or a few days, of sudden or gradual onset, with or without vomiting; shock, sweating, pallor or cyanosis, dyspnoea, a rapid thready pulse, distant heart sounds, a new cardiac rhythm, a fall of blood pressure and oedema. We may get a pericardial friction after a day or two in cases where the infarcted area reaches the outer surface of the myocardium. There may also be a leucocytosis and a somewhat more tardily developed pyrexia, expressions of an inflammatory reaction.

But there are atypical cases in which the symptomatology may differ from that of the classical syndrome, either quantitatively or qualitatively. Thus, pain may be lacking or negligible and some other feature or features may dominate the picture—an inexplicable sense of apprehension, marked dyspnoea, congestive heart failure and the appearance of a pathological rhythm. Moreover, these indications may set in in a very quiet way, to gain intensity as time goes on. Again the rare case has been met with in which the patient has weathered an attack of coronary thrombosis without being aware that he was in a serious condition.

Where myocardial infarction has occurred death may be immediate, speedy, or delayed. Where life is spared for a time the patient may die of intercurrent disease, may suffer subsequent attacks, or may develop cardiac failure.

From the patient's point of view pain is probably the most insistent feature. It is commonly held that anginal pain is sudden and severe. This is not altogether the case. The pain has no one particular characteristic. To quote Oille and Rykert, 'It may be a slight discomfort, a fullness, a pressure, a constriction, a burning, a dull ache, or a severe pain. It is a continuous wave of pain without rapid vibrations. It develops gradually, reaches the crisis, and gradually dies away. It is most frequently located in the middle line. It may radiate to one arm or both arms, to the shoulders, to the back, or to the neck, or, occasionally, to the face'.

The incidence of pain in coronary disease is a variable thing, even in the most advanced stage. In their study of 90 cases of coronary disease post mortem Oille and Rykert found that pain was a predominant feature in only 29 instances. Saphir and his co-workers, in 32 cases of coronary thrombosis, obtained a history of pain (during rest) in four only. They note also, as have others, that attacks of pain typical of cardiac infarction may occur in the absence of this lesion.

To explain the origin, nature and degree of anginal pain is a difficult task, one perhaps impossible in the state of our present knowledge. The most generally accepted theory is that anginal pain is due to ischæmia of the cardiac muscle, a theory linked up by Sir Thomas Lewis and his co-workers with the idea of the liberation of a pain-producing substance. There is much evidence to support this notion, part of it is based on animal experimentation. There are, however,

discrepancies in the findings of certain investigators which should be finally cleared up. In their experiments Sutton and King, Pearcy, Priest and Van Allen, and Sutton and Lueth (quoted by Katz, Mayne and Weinstein) found that pain was caused immediately on the occlusion of the coronary arteries and that this pain ceased as soon as the vascular occlusion was released. Is this pain due to ischæmia of the myocardium or to trauma of the nerve fibres about the coronaries? Ten years ago Singer stated that acute ischæmia of the heart muscle could be produced without exciting painful reactions. Sutton and Lueth found that injury of the pain fibres in the adventitia of the coronary arteries would cause pain. Katz and his collaborators, however, could not always duplicate their results. To clear up this matter they repeated some of the experiments and concluded that the painful response is due not to occlusion of the coronary artery but to stimulation of the afferent fibres in the nerve plexus surrounding the vessels and that ischæmia of the myocardium is at most only one of the many mechanisms operating of the nerve endings and nerve fibres which may give rise to anginal attacks. Dogiel was the first, nearly forty years ago, to demonstrate that there were sensory nerve endings in the adventitia of the coronary arteries. Woollard recently has shown that the nerves to and from the ventricles are concentrated chiefly around the coronary vessels, where they form a loose spiral network, and Harvey, together with many others, has proved that the rest of the myocardium is devoid of fibres sensitive to pain. All this suggests that if ischæmia causes pain it does so by stimulating the end-organs located in and about the coronary tree. Stimulation may take place, theoretically, through diffusion of the pain-producing substance from the myocardium to these end-organs or by a concentration of the pain-producing substance formed locally.

Stimulation of the nerve endings is not necessarily due to chemical substances, however. Sudden rises in blood pressure from many and various causes, by distending the coronaries, may mechanically stimulate the nerve endings in their walls and so cause pain. Katz and his co-workers suggest, further, that the arterio-sclerosis process as it spreads to the adventitia of the coronaries, or if associated with periarterial changes, may at first render the nerve endings within the walls over-sensitive and later, by destruction, insensitive to stimulation. Such conditions would almost certainly alter the responses. In the state of hyper-irritability stimuli which ordinarily would not affect the pain endings might readily do so and give rise to an anginal attack. Lesions near the orifices of the coronaries would, for anatomical considerations, be more likely to cause pain than would those in and near the finer ramifications. Infarction of the heart wall, if extensive, might be expected to cause destruction of the nerve endings caught in the process and so eliminate pain.

Reviews

AGENTS OF DISEASE AND HOST RESISTANCE INCLUDING THE PRINCIPLES OF IMMUNOLOGY, BACTERIOLOGY, MYCOLOGY, PROTOZOLOGY, PARASITOLOGY AND VIRUS DISEASES.—By Frederick P. Gay. 1935. Baillière, Tindall and Cox, London. Pp. xlii plus 1581, with 212 illustrations and 6 coloured plates. Price, 45s.

THE authors of this book have undertaken a very ambitious task. They have attempted to write a treatise on the ætiology of parasitic disease; they have attempted to weld together into one continuous story the various elements which constitute the ætiology of any disease, epidemiology, immunology and parasitology; they have attempted to produce a single volume

which can be presented to the student to whom it can be said 'If you read, digest, and remember the contents of this book, you will acquire a knowledge of the subject of parasitology—in its widest sense—that will be surpassed by few individuals'. They have very nearly succeeded, and how (as many an American student has probably said). The volume is magnificent and terrifying; it consists of 1581 large pages with narrow margins covered with print that is often quite small and never very large, and there is certainly the element of homogeneity even if it is not perfect.

About four hundred and fifty pages are devoted to immunology, six hundred to bacteriology, including the spirochætes and fungi, one hundred and twenty to virus.

diseases, one hundred and fifty to parasitic diseases, protozoal and helminthic, and there is a final section of practical results in which vaccines, sera, etc., are discussed. There is also a chapter on diseases of obscure aetiology, in which the aetiology of metabolic diseases is discussed. The inclusion of this justifies the very comprehensive title of the book. There is an interesting table of arthropod vectors of disease. (In this connection one of the minor tragedies of publishing occurred; the word 'arthropod' managed to escape the vigilance of the proof-corrector, in a page heading, just where it catches the eye.) No technique is included; this would certainly have been out of place.

The book is very comprehensive and very readable, and will form a valuable book of reference for senior students and medical investigators. It is well, but not overprofusely, illustrated, and there are a few excellent plates. There was a chart showing the seasonal incidence of disease that struck the reviewer as being very original and very useful for teaching purposes and reference.

L. E. N.

CLINICAL MISCELLANY. VOLUME II. 1935.—

Contributed by F. F. Harrison, M.D., C. C. McCoy, M.D., M. A. McIver, M.D., G. M. Mackenzie, M.D., M. F. Murray, M.D., R. M. Pike, Ph.D., J. H. Powers, M.D., D. K. Scheideff, M.D., and R. C. Tanzer, M.D. (Mary Imogen Bassett Hospital, Cooperstown, New York). Published by Charles C. Thomas, 220, East Monroe Street, Springfield, Illinois. Pp. viii plus 218. Illustrated. Price, \$3.00. Representative of the above-mentioned firm in England is:—Baillière, Tindall and Cox, London

A book of this kind, especially when it is encountered in a country so far away from Cooperstown that ignorance of the very existence of the Mary Imogen Bassett Hospital is excusable, needs some introduction, some explanation as to why it ever came into being. For this explanation one naturally looks to the preface, and in this book one does not find it. Instead, there is a rather irrelevant discussion in good but flowery English on the development of what the writer calls 'the new medicine with its roots in the laboratory'. Admittedly, medicine of fifty years ago was very different from medicine of to-day, but surely, no new principle has been introduced. Since the days of Harvey it has been the aim of scientific medicine to find out all we could about the patient and his abnormalities by all the means at our disposal; our fathers, or grandfathers, didn't use x-rays in the diagnosis and treatment of disease, because they happened to be living in an age before Röntgen and his coevals, and they did not use modern biochemical methods because the science of chemistry had not developed far beyond the 'inorganic' stage, but they did test urine for sugar and albumin and they did do blood counts. No, it is just a matter of natural development of the combined art and science of medicine in a scientific age, and it is natural that the development on the scientific side should be more pronounced.

The book consists of twenty papers on a variety of subjects, illustrated by case reports, or by a case report, in which both the laboratory and the clinical findings are given. The articles are well written, the cases well selected, and the deductions appear to be sound. The book provides very pleasant and instructive reading for any practitioner of the art and science of medicine.

L. E. N.

AN INDEX OF TREATMENT.—By Various Writers.

Edited by Robert Hutchison, M.D., LL.D., F.R.C.P. Eleventh Edition. 1936. John Wright and Sons, Limited, Bristol. Pp. xv plus 1020. Illustrated. Price, 42s.

THE publication of a new edition of this world-renowned index of treatment is an event of no little importance. It is nearly five years since the last edition was published, which in these fast-moving times

means that there was much scope for revision. As the editorship has been undertaken by that great physician, Dr. Robert Hutchison, it is unnecessary to add that this revision has been ably carried out.

A number of sections have been completely rewritten and new contributors have been introduced to take the place of those who have died or retired. We note with pleasure that most of the contributions of Mr. James Sherren, who was the editor of the last edition, have been retained and brought up to date.

The tropical diseases sections are mostly done by Dr. Manson-Bahr, which should be a guarantee that they will be up to date; we were therefore a little surprised to see that sodium antimony tartrate was given preference in the treatment of kala-azar, and that there was no mention of carbarsone in the treatment of chronic amœbiasis. Also his treatment of anæmias in tropical conditions is not very satisfactory; he says that arsenic is more useful than iron in 'secondary' anæmias, and of the anæmia of ancylostomiasis that 'iron is useful in the later stages of recovery, but is not advisable at first'; this advice is not only misleading but dangerous, as in the treatment of severe cases of hookworm anæmia it is much safer to bring the hæmoglobin content up to about fifty per cent with iron before giving the rather strenuous treatment that is necessary to clear out the worms. Most of the other sections on anæmia are done by Professor J. L. Witts and are excellent. There is a new and very useful section on the anæmias of childhood by Dr. R. Lightwood.

There is probably no better book of its kind in the English language and the present edition has certainly maintained the standard set by its predecessors. A stronger and more serviceable binding has been used in this edition; it also has the advantage of not appealing quite so much to the taste of cockroaches, as did the cloth cover of the last edition.

L. E. N.

LECTURES ON DISEASES OF CHILDREN.—By R. Hutchison, M.D., LL.D., F.R.C.P. Seventh Edition. 1936. Edward Arnold and Company, London. Pp. vii plus 452. Illustrated. Price, 21s.

THESE lectures of Robert Hutchison were originally delivered thirty years ago at the London Hospital. They were collected and published in the form of a book which has now gone through seven editions and a larger number of reprintings. The book has acquired a reputation as a classic on children's diseases, and is so complete that it is often looked upon as a handbook. The author in his preface discourages this idea, and wishes the book to remain simply as a series of discourses on certain aspects of pædiatrics.

The lectures do not of course remain in their original form but are rewritten and brought up to date with each edition. In this edition two lectures have been completely rewritten; the chapter on constipation in children provides a very good example of the author's easy and concise style as a teacher; he does not bore his audience with a large table of possible causes of chronic constipation, but takes up the most common causes first and passes from one to the next so easily that the reader obtains a grasp of the whole subject without having to memorize a long list of the causes of constipation under a number of headings. This is the essence of the method of teaching that is so characteristic of the English school, it is the form of teaching that is the antithesis of the cram-book method, and it is unfortunately not the characteristic of the teaching in the colleges and medical schools in India.

The writer lays emphasis on diet as a cause of constipation but issues a warning against the present-day tendency to assume that the proper regulation of the diet is the beginning and end of the treatment of this condition. In fact, throughout the book, though he has much to say on the subject of diet, he attempts to counteract the present extreme fashion of attributing all ills to dietetic errors. He discusses the negativistic child in relation to constipation, and in this case he

directs most of his treatment towards the parents or guardians.

The other chapter that has been rewritten is on infantile scurvy and pink disease. The last named was only described as a disease entity about twenty years ago, but now it appears to be universally recognized, under a number of different names; one wonders how often the disease occurs in this country; the bright pink appearance of the extremities that is its most characteristic feature might easily be masked in the Indian child. As at present little is known about the ætiology or the treatment of this condition, failure to recognize it does not leave a serious stain on the escutcheon of Indian pædiatrics.

Nothing more need be said by way of recommending this classic on children's diseases, except that a new and up-to-date edition has been published.

L. E. N.

DISEASES IN CHILDHOOD: A CLINICAL STUDY.—

By R. S. Frew, M.D. (Edin.), F.R.C.P. (Lond.). 1936. (The First Year.) Macmillan and Company, Limited (St. Martin's Street), London. Pp. xv plus 669. Illustrated. Price, 30s.

THIS book is a clinical study of the first year of life, based on a large experience at Great Ormond Street Hospital for children. As a result of his observations the author is convinced that the most important factor in determining the characters that disease assumes in childhood is the age of the child, and with this in mind he divides the book into three sections and sets out to describe these diseases as they occur in the first month, the first to the sixth, and the sixth to the twelfth months of life. During this time the physiology and the anatomy of the infant are changing with great rapidity, and it is these facts which give the appearance of disease such diversity during these periods.

Several theories of the greatest interest are put forward. The author believes that 'hyperphlebæmia', or increased pressure in the foetal veins, is responsible for such varying conditions as intra-cranial hæmorrhage, epilepsy, hydrocephalus, coeliac disease and even genius, and that it is also a factor in the ætiology of rickets. He suggests further that microcephaly and mongolism which are often found in association with other abnormalities such as congenital heart disease, undescended testicle and Meckel's diverticulum, may have a common origin in a premature failure of the yolk supply in intra-uterine life, while achondroplasia may be due to a preponderance of the vitelline over the placental circulation at the same period. These theories are supported by observations on a large number of cases examined post mortem as well as clinically.

The feeding of infants is discussed as a clinical and not a laboratory problem; the digestive system of the infant being the variable factor of the first importance. The author clings to the use of the weaker mixtures for premature infants, diluting breast milk in certain cases.

The descriptions of diseases are supported by figures from a consecutive series of 8,823 outpatient cases and a vast amount of other material and although some of the new theories will arouse criticism, they cannot be dismissed lightly.

Dr. Frew has done his subject the greatest service in emphasizing the importance of the age distinction. His theories shed new light on some of the darkest problems of the diseases of infancy. The study cannot fail to act as a stimulus to all who are concerned with the treatment of sick children.

M. N.

PÆDIATRIC NURSING.—By John Zahorsky, A.B., M.D., F.A.C.P. Assisted by B. E. Hamilton, R.N. 1936. The G. V. Mosby Company, St. Louis. Pp. 568, with 144 illustrations in the text and 7 coloured plates. Price, \$3.00

THIS book contains a large amount of information regarding the diseases and nursing care of infants and

children, in the hospital and in the home. The first part is devoted to what the author calls the science of pædiatrics, and includes chapters on growth, nutrition, methods of feeding, the prevention of disease, the study of certain symptom-complexes and diagnostic technique. This is followed by short descriptions of children's diseases affecting the various systems of the body, and the infectious diseases. At the end of each chapter there is a list of questions on the subject-matter. This suggests a lack of mental training on the part of the student nurse that is not consistent with the technicalities and free use of medical terms used in the book. A glossary is given at the end, and this again suggests that the meaning of many expressions would not be understood.

The subject-matter in the first part of the book suffers from lack of a clear distinction between the conditions and nursing of the new-born, and that of older infants and children.

The second part of the book is concerned with the practical side of nursing of children. It contains excellent illustrations, and full descriptions of many of the methods in use. Emphasis is laid on the internal arrangements of a children's hospital, the various wards and diet kitchens. The technique of 'medical asepsis' is clearly set forth. One misses the due attention which might have been given to the subject of fresh air and ventilation, and sun treatment.

The author believes that 'rocking to sleep' and constant stimulation when awake are desirable for a baby but he would prevent thumb sucking. He puts forward a strong case for an admission room, in which the mother may stay with the child for a few days on its admission to hospital, so that the first strangeness may wear off before it is transferred to the children's ward.

M. N.

MEDICAL RESEARCH COUNCIL. 'THE BACTERIOLOGICAL GRADING OF MILK'.—By G. S. Wilson. Special Report Series No. 206. Published by His Majesty's Stationery Office, London. Pp. 392. Illustrated. Price, 7s. 6d.

MILK can be graded bacteriologically either with regard to its cleanliness and keeping quality, or with regard to its safety. The tests used in these two respects are fundamentally distinct; on the one hand they depend on the relative abundance, in the sample, of the saprophytic bacteria which naturally occur in milk, and on the other upon the freedom of the milk from micro-organisms capable of giving rise to disease in human beings. In this respect attention is given solely to the bacteriological methods available for determining cleanliness and keeping quality; the safety of milk, as shown by the absence of pathogenic organisms, is not discussed.

The particular objects of the investigation were, firstly, to provide experimental data for the conclusion as to the relative value and precision of the procedures current in the bacteriological testing of milk, and, secondly, to define a simple test by which the grading of milk in terms of its content in living bacteria can be reliably performed. The purposes have been successfully fulfilled.

The two methods which have hitherto been mainly used in grading milk for cleanliness, namely, the plate count and the coli-form count, are neither of them entirely suitable. Both methods have a large experimental error, and the plate count in particular, in addition to being complex and expensive, gives an appearance of accuracy which is entirely fictitious and misleading. The value of the coli-form count in the examination of water is well attested by years of experience, but the fundamental assumptions on which its interpretation is based do not hold true for milk. These, and various other forms of test, have been carefully assessed, with the results shown in the book under review.

The general conclusion reached by Professor Wilson is that the best test for the purpose is a modification, which he describes, of the methylene-blue-reduction

test. In its earliest form this test was open to the objection that, although it could pick out very dirty samples, it was unsuitable for the examination of milk of a higher degree of cleanliness. The modification which the present investigation has introduced removes this ground of criticism. The modified test is simple, inexpensive, and accompanied by only a very small experimental error; it should therefore be of unrestricted value for the grading of milk on the basis of cleanliness and keeping quality, and should provide a satisfactory means whereby the milk of all producers can be regulated and frequently examined.

This method which has been accepted by the Ministry of Health in England, and which should require only slight modification for Indian conditions, might well be adopted as a standard method in this country.

RECENT ADVANCES IN CARDIOLOGY.—By T. East, M.A., D.M., F.R.C.P., and C. Bain, M.C., D.M., M.R.C.P. Third Edition. 1936. J. and A. Churchill, Limited, London. Pp. xi plus 350, with 14 plates and 85 text-figures. Price, 12s. 6d.

THE scope of this book, as with most of the others of this excellent series, is a little wider than its title suggests. The authors have attempted to cover the whole subject of cardiology, laying special emphasis on recent advances and not going as deeply into the well-established fundamental principles as a formal textbook on cardiology would do.

The advances that have been made in all branches of this subject during the last few years have made it necessary to rewrite the whole book for this edition. A few new chapters have been added, notably those on vascular diseases and on congenital lesions.

The chapter on peripheral circulatory failure is an example of the successful treatment of a very difficult subject. During the last decade or so much experimental work has been done that has a bearing on this subject and some of it appears to be contradictory. By way of illustration the authors have taken two diseases in which peripheral circulatory failure is prominent, diphtheria and pneumonia, and have described the cardiac and circulatory changes in each. There are many points of similarity in these two conditions, but in the latter the heart does not seem to be so definitely attacked by the toxin of the infecting organism. In the treatment of the latter condition the authors point out—and it is impossible to refuse their conclusions on theoretical grounds—that digitalis is useless as it has, and can have, no effect on peripheral circulatory failure. The section headed 'general considerations of treatment' (i.e., of peripheral circulatory failure) is a little disappointing, as they discuss morphia, strychnine, pituitrin, adrenalin, coramine, injection of fluid, and hydrotherapy, with frequent use of the term 'may be tried', but without giving the reader any very definite lead regarding the special indications for, and the relative values of, each.

The book is well supplied with electrocardiograms and orthodiagrams, all of which are very well produced. It is a worthy member of the invaluable 'Recent Advances' series.

L. E. N.

ESSENTIALS OF CARDIOGRAPHY.—By H. B. Russell, M.D., M.R.C.P. (Lond.). 1936. J. and A. Churchill Limited, London. Pp. vi plus 82. Illustrated. Price, 7s. 6d.

THIS is an extremely useful little book which should be very popular with the student and also with the practitioner who passed through his medical school before the two subjects discussed in the book, the electrocardiogram and the orthodiagram, reached the high standard of their perfection of the present day. As the title indicates, the book is not a treatise but deals only with the essentials of the subject. It is written in simple language which anyone without any previous knowledge of the subject can understand.

First the principles of the electrocardiograph are described, then the normal electrocardiogram with its

normal variations. There are four chapters on abnormal electrocardiograms, on axis deviation and heart block, on irregularities (e.g., sinus arrhythmia and auricular fibrillation), on signs of myocardial degeneration, and on auricular flutter and coronary thrombosis. There is a short and useful chapter on the type of case in which an electrocardiogram is likely to prove of value. The x-ray examination of the heart is dealt with in one chapter; the cardiac measurements, the normal orthodiagram and its variations according to the position of the patient, the changes in shape brought about by dilatation of different chambers and by defects in the different valves, and the characteristic orthodiagrams in other diseased conditions, such as hypertension and exophthalmic goitre, are the subjects discussed.

Each point is explained with the help of an illustrative electrocardiogram, or orthodiagram as the case may be; the latter are given as line drawings, but the orthodiagram is the one form of x-ray picture that is so clear that it is unnecessary to reproduce the original. One misprint—'later' for 'latter', on p. 62—was noted. The publishers have done their work well and have produced a very neat little volume. It is a book that we can unhesitatingly recommend.

L. E. N.

SYNOPSIS OF SURGICAL ANATOMY.—By Alexander Lee McGregor, M.Ch. (Edin.), F.R.C.S. (Eng.). With a Foreword by Sir Harold Stiles, K.B.E., F.R.C.S. (Edin.). Third Edition. 1936. John Wright and Sons Limited, Bristol. Pp. xviii plus 664. With 648 figures. Price, 17s. 6d.

WHEN this book was first published in 1932, it was accorded a splendid reception and we had no hesitation in acclaiming it as a masterpiece of its kind. The fact that it has been through three editions within the brief period of four years sufficiently testifies to both its worth and popularity. Within a short time it has established itself as a surgical classic.

The present edition represents a revision of the previous issue. Furthermore it has been amplified by a dozen new figures and a few additional pages of text. The work of Davie on renal-adrenal adherence has been included. The description of the ossification of the clavicle is based on the recent work of Fawcett and Mall. The section on diaphragmatic hernia is modelled on Sir Thomas Dunhill's Arris and Gale lecture. It may also be mentioned that the new terminology is used throughout the book with a few acceptable exceptions.

It is, in fact, a remarkable book and the author deserves great credit for the amount of painstaking work he has put into this volume. The illustrations alone give it unique value. We heartily commend the new edition to the notice of the senior medical students and all teachers of anatomy and surgery. It would be no exaggeration to say that this book is indispensable for the proper study of surgical anatomy. The get-up and print are excellent. The index is adequate and has been considerably amplified.

P. N. R.

POST MORTEM AND MORBID ANATOMY.—By Theodore Shennan, M.D., F.R.C.S. (Edin.). Third Edition. 1935. Edward Arnold and Company, London. Pp. viii plus 716. Illustrated. Price, 30s.

ALTHOUGH this book is in its third edition it is not nearly as well known in India as it deserves to be. The title of the book explains its scope. It covers ground not usually covered in textbooks of pathology. There are a few introductory chapters on general technique, but most of the practical details are interspersed throughout the various chapters, which is a natural and satisfactory arrangement. Gross morbid changes in various disease conditions are described in detail and a few notes on histology are given, the arrangement of the chapters being more or less on a regional basis. Towards the end of the book there are special chapters on post mortems in death from poisoning, on still-born infants and in the case of deaths under general

anæsthesia. There is a very useful appendix that gives the formulae for preserving, fixing and staining of tissues and other useful details of technique, and some tables of equivalent measurements.

No very extensive changes have been carried out in this new edition, but many sections have been re-written, notably those on endocarditis, tuberculosis of the lungs, gastric ulceration, the splenomegalies, nephritis and the nephropathies.

As it is a book of moderate size and has to cover a very wide field, a rather brief treatment of each subject was necessary and errors of omission must be condoned; it should however be stated that these are not either numerous or obvious. It is not quite clear to the reviewer what is meant by the statement that 'the destruction of red blood corpuscles which renders necessary the erythroblastic reaction, and which brings about the clinical picture of a severe anæmia, can only be caused by the action of a toxin, to which the first response of the marrow is leucoblastic'. If the statement is meant to be a general one, then it is untrue, but if it is meant to apply only to toxic conditions then it is redundant. Throughout the text the words 'toxic' and 'toxæmia' are used a little too freely.

These are unimportant criticisms and on the whole the book is the best of its kind that we know. The illustrations are numerous and well chosen. It is a book that we can thoroughly recommend to the student and to his teacher.

L. E. N.

A TEXTBOOK OF ROENTGENOLOGY: THE ROENTGEN RAY IN DIAGNOSIS AND TREATMENT.—By B. J. M. Harrison, M.B., Ch.M., D.M.R.E. (Cantab.), F.A.C.R. 1936. Baillière, Tindall and Cox, London. Pp. xxvi plus 826. Illustrated. Price, 45s.

THIS is one of the best books on radiology that has been published for a long time. It deals with the whole subject in a manner which, though novel in a textbook, is yet the only rational method of doing it. The method consists in first giving a concise account of the normal anatomy of the particular part, then considering the pathological states, and finally deducing from these why the radiological appearances are such as they are. As Dr. Howard Pirie in his short preface points out, 'It is a development of the times showing that the roentgenologist must be a pathologist to take his place as a consultant'.

The chapter on physics, followed by one on radio-physiology and biology are excellent, the latter should be read by every serious clinician.

All the newer developments of the subject such as kymography and the radiology of the heart in general are fully discussed.

The sections on the respiratory tract and on bones are specially well done; the views expressed are really up to date and always sound.

Treatment by means of x-rays does not form a separate chapter. It is dealt with in each section in turn, such as inflammation, infection and the diseases affecting the various parts of the body.

The index is very complete.

The book will be indispensable to the serious radiologist and should be equally so, as a work of reference to the physician or surgeon.

G. G.

POST-GRADUATE SURGERY.—Edited by Rodney Maingot, F.R.C.S. (Eng.). With an Introduction by the Right Hon'ble Lord Moynihan of Leeds, K.C.M.G., C.B., M.S., F.R.C.S. (Eng.). 1936. Medical Publications Limited, London. To be complete in three volumes. Volume I. Pp. xvi plus 1742 with 846 illustrations. Price, 50s. per volume or £6 6s. per set of three volumes. Sold in complete sets only. Price, Rs. 150. Payable Rs. 20 per month: 10 per cent discount to cash purchasers. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta

It is with great pleasure that we welcome the first volume of 'Post-Graduate Surgery'. We predict that

this work will soon become the standard reference book on surgery in the English language. A certain basic knowledge of surgery having been assumed, all available space has been devoted to the consideration of special methods of investigation and treatment and the pre- and post-operative management of cases. Consequently the book will be especially useful to qualified surgeons and post-graduate students of surgery. This monumental work is dedicated to Lord Moynihan, who writes an inspiring introduction, emphasizing the importance of post-graduate study. Besides, the book carries a message to the young surgeon, reminding him that 'Surgery is not only Science, not only Art, it is a Sacrament'. This volume has been compiled by a team of twenty capable contributors under the editorship of Rodney Maingot. Amongst the former, we note with pleasure the names of several younger men. That the subject-matter has been handled with judicial impartiality is proved by the fact that the list of collaborators include several physicians, radiologists and an anæsthetist.

The present volume consists of five parts. In part I, Langton Hewer deals with the subject of anæsthesia, which is considered in three sections, *viz*, general anæsthesia, local analgesia and choice of anæsthetic.

Part II, consisting of nearly 1200 pages, deals with abdominal surgery and is subdivided into 12 sections. The opening chapter deals with the investigation of a case of dyspepsia by Rodney Maingot, Sleigh Johnson and Deville. The common diseases of the stomach and the duodenum and their surgical treatment are clearly described by the former. There is a special article on Billroth I type of gastric resection by Dr. Finochietto of Buenos Aires. It is claimed that this operation was performed independently and contemporaneously by Péan of Paris. The chapter on medical treatment of peptic ulcers by Hurst should be read by every one. If suitable treatment is given for a sufficient period nearly every gastric ulcer eventually heals as well as almost 75 per cent of duodenal ulcers and 50 per cent of the much more intractable anastomotic ulcers, which follow gastric operations.

The surgery of the biliary tracts is dealt with by Rodney Maingot, Moore and Dickson Wright. The chapters are illustrated with excellent diagrams. Mention may be particularly made of the possible errors and accidents, which must be avoided in the operation of cholecystectomy. In the list of contributors to volume I, there is an unfortunate error of omission; there is no mention of the name of Dickson Wright, although he has contributed several interesting chapters in the present volume. The surgery of the ruptured and diseased spleen has been very fully discussed by Rodney Maingot. Radio-therapy, in splenic diseases by Levitt and Egyptian splenomegaly by Stiven are worthy of note.

The diseases of the appendix are described by Hamilton Bailey in his characteristic lucid style. The expectant or Ochsner-Sherran treatment is advocated except under five circumstances. The surgery of the colon is in charge of Wakeley, who gives a most illuminating account of the subject. He recommends the two stage Paul-Mikulicz operation and the partial colectomy of Devine. The chapters on intestinal obstruction by Cockinis are worthy of careful consideration. The treatment of paralytic ileus will meet with general approval for its surprising simplicity and brevity. A posthumous contribution by Tyrrel Grey is also included. Post-operative complications are described by the editor.

In part III, consisting of 220 pages, the surgery of the anus and rectum has been written by Ernest Miles. It is an outstanding and authoritative contribution on the subject. For the treatment of rectal carcinoma, the abdomino-perineal excision has been advocated. It is worthy of note that the modern techniques of anæsthesia and surgery have reduced the rate of mortality to 10 per cent.

Part IV by Cecil Bull deals with the x-ray diagnosis of the diseases of the alimentary and urinary tracts and is very well illustrated.

In part V Stanford Cade describes the radium treatment of malignant disease and Malcolm Donaldson, radiotherapy in diseases of women.

In conclusion, we repeat that it is a monumental work on surgery and will rank with Choyce's 'Surgery' and Carson's 'Operative Surgery'. Our heartiest congratulations are offered to the editor and his team of collaborators on the successful completion of their Herculean task. We await the publication of the succeeding volumes with keen interest. The printing, get-up and illustrations are excellent. The addition of a few coloured plates would have enhanced the value of the book. We hope that this omission will be rectified in the next edition. An adequate index has been appended.

P. N. R.

MINOR SURGERY AND THE TREATMENT OF FRACTURES. By Gwynne Williams, M.S., F.R.C.S. 1936. J. and A. Churchill, Limited, London. Pp. viii plus 485. With 284 illustrations. Price, 10s. 6d.

THIS book on minor surgery and bandaging is so well known that it would be superfluous to offer an introduction for its twenty-first edition. The substitution of fractures for bandaging in the title is a recognition of the fact that a knowledge of the treatment of fractures is essential to every house surgeon.

The book consists of seventeen chapters and fully covers the subject. A few helpful criticisms might be offered. On tracheotomy several varieties of metal tubes have been described, but in practice these are less frequently used than the rubber ones. For gastric lavage the old-fashioned stomach tube has been described. The small weighted stomach tube is certainly preferable. The chapters on fractures would be very useful to the senior dressers and house surgeons. Much space has been devoted to the description of Sayer's method of treatment of a fractured clavicle. This archaic method hardly deserves the respect shown to it. It is gratifying to note that the Smith-Petersen pin has been mentioned in connection with the treatment of intracapsular fractures of the neck of the femur. The chapter on anaesthetics has been rewritten by Dr. Webber and will be found very useful.

An adequate index has also been appended.

P. N. R.

PRACTICAL POINTS IN ANÆSTHESIA: A CLINICAL HANDBOOK FOR STUDENTS AND GENERAL PRACTITIONERS.—By H. K. Ashworth, M.B., Ch.B. (Vic.), M.R.C.S. (Eng.), L.R.C.P. (Lond.), D.A., R.C.P. & S. (Eng.). With a Chapter on Local Anæsthesia by H. T. Simmons, B.Sc., M.B., Ch.M. (Vic.), F.R.C.S. 1936. J. and A. Churchill Limited, London. Pp. viii plus 160, with 16 illustrations. Price, 7s. 6d.

THIS book was originally published serially in the *Manchester University Medical School Gazette*, between 1933 and 1935. It is a clinical handbook on anaesthesia and presents in a very readable and practical form the salient features of the subject. The author begins with pre-operative considerations and facts, some of which are emphasized by his personal experiences. Next, after a brief description of the anaesthetic equipment he deals with induction and maintenance of general anaesthesia, depicting the various stages and their signs with a diagrammatic table, followed by practical notes on eye reflexes, determination of the state of circulation and treatment of complications. One chapter has been devoted to gas and oxygen anaesthesia and another to spinal anaesthesia. Barker's stovaine solution is recommended as the best though not ideal drug for the latter purpose. A paper published by the author in the *Lancet*, 26th May, 1934, has been incorporated in this section. Injection of ephedrine twenty minutes before the administration of the anaesthetic has been recommended to combat the fall of blood pressure.

Instructions are given for the management of special cases such as heart disease, dental extractions, etc., followed by a chapter on basal narcosis, the most important development in anaesthesia during the present century. The last chapter (by H. T. Simmons) deals briefly with the types of local anaesthesia and the anaesthetic drugs used, with notes on their toxicity. Dogmatism is a remarkable feature of this book, but elementary books are rarely useful if they are vacillating in character. The book is well produced and should be of real value to students and general practitioners. A summary of the use of other anaesthetics such as rectal paraldehyde and latest drugs such as cyclopropane would prove an useful appendix.

R. C.

SYMPTOMS AND SIGNS IN CLINICAL MEDICINE.—

By E. Noble Chamberlain, M.D., M.Sc., M.R.C.P. 1936. John Wright and Sons Limited, Bristol. Pp. xi plus 424, with 282 illustrations, of which 17 are in colour. Price, 25s.

THIS book is evidently intended as a companion to Hamilton Bailey's 'Demonstrations of Physical Signs in Clinical Surgery', but it must be confessed that it does not reach the high standard of that popular work.

The author seems to have fallen between two stools, for the book is neither dogmatic enough for students beginning their clinical work, nor full enough to serve as a work of reference, while some of the statements and a few of the diagrams are frankly misleading. This is a pity, because the book is eminently readable, and the printing, illustrations and general 'make-up' are of the high order that one associates with the firm of John Wright and Sons.

The first two chapters are good, chapter one being devoted to general considerations and chapter two containing some very good pictures of external appearances. The different systems are then considered in detail, and the book ends with a couple of chapters on medical operations and minor laboratory procedures. The chapter on the examination of sick children, by Dr. Norman Capon, deserves nothing but praise; it is delightfully written and reveals that generous mixture of sympathy, wisdom and common sense which marks the first class children's specialist.

The rest of the book is, however, distinctly 'patchy'. One cannot help being brought up with a jerk on reading 'Palpation is only of occasional value in the examination of the intestines', while the only reference to appendicitis, apart from the well-known statement that it may cause general peritonitis, points out that a patient with the disease may walk with a limp. We in India see more typhoid than they do in England, but it is disconcerting to find no mention of blood culture as an early means of diagnosis.

Again, the neurological section is good in parts, especially that on examination of the eyes (incidentally, does monocular diplopia exist?), but surely it is time to abolish from textbooks such statements as 'Cerebral hæmorrhage or apoplexy is one of the commonest vascular lesions of the brain, in fact, perhaps, the commonest disease of the nervous system'. The careful work of Janeway, Collier and others has shown that thrombosis is the common lesion in survived attacks of apoplexy, while hæmorrhage is responsible for the final fatal one. It is odd to find no mention of lumbar puncture as a means of distinguishing the two.

The diagrams of 'crossed paralysis' give no indication of the decussation of the geniculate bundles, so the unwary may deduce that the phenomenon results from non-decussation of the cranial motor nerves, while in the diagrams of syringomyelia and the Brown-Séquard syndrome the fibres conducting pain and thermal impulses apparently reach the brain *via* the pyramidal tracts, a state of affairs with which neither the Creator nor any examiner would agree.

In a book of this kind it is admittedly difficult to know what to include and what to omit, but it cannot

be said that the author has been entirely happy in his choice.

H. W.

HUMAN PATHOLOGY: A TEXTBOOK.—By H. T. Karsner, M.D. Fourth Edition. Revised. 1935. J. B. Lippincott and Company, Philadelphia and London. Pp. xii plus 1013, with 18 illustrations in colour and 443 in black and white. Price, 45s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 33-12

SINCE its publication in 1926, this book has passed rapidly through four editions. This speaks for the quality of the book and its appreciation by students and teachers alike. It may also be taken to show that the author has been continually trying to keep the work fully up to date. The book has been thoroughly revised and many of its chapters completely rewritten in order to keep the subject-matter wholly abreast of the times. This has, of necessity, led to the insertion of more than three hundred references to the literature. In spite of all this, however, there has been only a negligible increase in the bulk of the volume (23 pages only). It will thus be evident that Professor Karsner has had to exercise meticulous judgment to discard the old and introduce newer matter. The publishers are to be congratulated on the beautiful execution of their work, both in printing and reproduction of illustrations. It is an extremely difficult thing, almost impossible to many, to treat the subjects of general and special pathology in a convenient single volume. But the author has succeeded in attaining this object so well as to deserve our highest commendation.

However well a book may be written, there is always some room for its criticism and this is true for this book also. While going through its pages, one finds a plethora of discussions with the individual opinions of different persons crowded together. While such a book is very suitable for teachers and advanced workers, it becomes somewhat embarrassing to an ordinary student who gradually gets lost among these conflicting opinions. Some comments must be made about the diagrams. Although many of them are original and very good, there are still quite a large number which are neither very diagrammatic nor realistic. In fact some of them fail to illustrate what is mentioned in the text. This defect can be easily overcome by replacing them by good photomicrographs and also photographs from actual specimens. Just to mention a few, the diagrams like those of infarcts of the spleen, lobar pneumonia, pulmonary tuberculosis, miliary tuberculosis of lung and meninges may be said to be lifeless while those of Hodgkin's disease, bone marrow, broncho-pneumonia and many others should not have found place in the text at all. When reading through the pages one often feels the need of good pictures here and there. For instance photomicrographs like those of exophthalmic goitre, chromophobe adenoma, leukaemic infiltration, etc., would never be out of place.

Some re-arrangement in the text might also be done with advantage. For example the pathological changes in the skeleton might be more conveniently discussed under the disease of the pituitary body. Similarly, when discussing pigments, the writer has gone out of his way to describe the details of the melanotic tumours. Such a common and important subject as fracture of bones has been dismissed with a few lines only. Lastly, terms like caseation necrosis, tubercle bacillus, bone aneurysm, etc., should be discarded and modern scientific nomenclature introduced. Under the regeneration of bone, the author has not even mentioned the names of Leriche and Pollicard although their views are too strong to be disregarded in modern days.

This gives the impression of a reader who is very fond of this excellent book and the above facts have been pointed out with a spirit of constructive criticism which need not in any way be taken to indicate he fails to appreciate the quality and excellence of this admirable book.

M. N. D.

MEDICAL MYCOLOGY: FUNGUS DISEASES OF MEN AND OTHER MAMMALS.—By C. W. Dodge, Ph.D. 1935. The C. V. Mosby Company, St. Louis. Pp. 900. Illustrated. Price, \$10.00

THIS book is an extremely valuable production for it is the first comprehensive publication on the subject. Hitherto for a beginner the task of obtaining a basis on which to found his work has been almost impossible for he has had to wade through numerous papers scattered throughout the scientific journals of the world, and then again the classification is in such a chaotic state that the tendency for each worker to formulate a classification of his own seems to have been almost universal, so that the more one read the more confused one became.

The book supplies the above deficiency for within its pages is gathered the great experience of the author, together with his wide knowledge of the literature, the latter being testified to by the fact that he gives approximately 4,000 references.

It is useless to try and review in detail a book of such a kind so suffice it to say that it is a book that fills a definitely vacant space in the library of medical literature, and no serious worker on medical mycology can afford to be without it. On account of its high technical excellence and wealth of detail its appeal will be somewhat limited for it will not be of great value to the average practitioner, which is somewhat unfortunate, for one feels that this great effort of the author deserves to be rewarded by at least as wide a circulation as a successful detective thriller.

In the reviewer's opinion it may be summed up as one of the most original and scientifically valuable productions that he has encountered in medical literature for many years.

The binding, paper and printing are worthy of the subject-matter.

P. A. M.

RECENT ADVANCES IN DERMATOLOGY.—By W. N. Goldsmith, M.A., M.D. (Camb.), M.R.C.P. (Lond.). 1936. J. and A. Churchill, Limited, London. Pp. xv plus 522, with 8 coloured plates and 50 text-figures. Price, 18s.

THIS book is a fitting companion volume to the others in this well-known and increasingly valuable series of 'Recent Advances' that have been published during the last few years by Messrs. J. and A. Churchill.

As this is the first edition of the book some of the discoveries mentioned date back about 20 years so they are not strictly *recent*, however they are important and probably not generally known so that is sufficient excuse for their inclusion.

The sections on the reticulo-endothelial system and its relation to dermatology, allergy, fungus infection and filter-passing viruses appealed to the reviewer as of special interest, but that does not mean that the remainder of the book is not of equal value for the author has mentioned practically all the other important skin diseases as well as adding notes on any new ones that have been described.

The author has conferred a boon on the busy worker for he has condensed in a masterly manner the salient points culled from very numerous papers so that one is enabled to gain in a few hours' pleasant reading information that could only be otherwise obtained by reading through hundreds of articles written in many languages.

One cannot do better than follow the suggestion in the preface of '.....ploughing bravely through the chapters in their proper order (and then perhaps doing it again)'.

P. A. M.

A MANUAL OF PRACTICAL OBSTETRICS.—By O'Donel Browne, M.B., B.Ch., B.A.O., F.R.C.P.I., L.M., M.C.O.G. 1936. John Wright and Sons, Limited, Bristol. Pp. 363, with 10 plates, some in colour, and 236 illustrations. Price, 20s.

HERE is a well-written, well-produced, eminently practical book. While its individuality gives charm,

it also invites criticism, or perhaps one should say argument, for all the while there is the feeling that the advice given has the weight of practical experience behind it.

For the most part the teaching is that of the Rotunda school, and one of the many good things in the book is the chapter on radiology by Dr. C. L. McDonogh, which will, we hope, draw wider attention to this powerful but rather neglected aid to the practice of obstetrics.

A few errors have crept in, for instance the pressor principle of pituitary extract is attributed to the anterior lobe, figure 43 shows a first-vertex labour in progress, while the text describes a second-vertex, and two different treatments of ophthalmia neonatorum are described, the first of which would be condemned by most ophthalmologists as it includes twice daily instillation of two per cent silver nitrate, but the second line of treatment, in Dr. Collis's excellent article on neonatal care, is the usual modern one.

The author's policy of complete non-interference in an occipito-posterior presentation evokes disagreement, for both manual rotation and Kielland's forceps have many successes to their credit, and there are few pleasanter professional experiences than to turn a persistent occipito-posterior baby and deliver it without damage to mother or child. Nor can one agree that in the matter of breast-feeding the mother should be given such complete freedom of choice as is here advocated, for many a time a little kindly advice has turned a selfish woman into a good mother.

For post-partum hæmorrhage continuing after removal of the placenta the author recommends plugging the uterus and advises pubiotomy for certain cases of disproportion 'as an emergency measure and as a means of escape from a difficulty which has unexpectedly arisen'. These measures must be more popular in Ireland than in London. A somewhat novel feature is the combining of secondary uterine inertia and threatened rupture of the uterus in one description, in which it is pointed out how the latter may follow the former.

In short, a practical, stimulating book, which should be useful to Indian students and practitioners, especially to those who wish to study in Dublin.

H. W.

MODERN METHODS IN PSYCHIATRY.—By J. Norman Pacheco, M.R.C.S. (Eng.), L.R.C.P. (Lond.), I.M.D. 1935. Published by the author (5, Rose Lane, Richmond Town, Bangalore). Printed at the Catholic Press, Ranchi. Pp. 283. Price, Rs. 5. Agents:—Messrs. Chackerberty Chatterjee and Company (15, College Street), Calcutta

THIS modest little book reflects very creditably on the diligence of its author, for, as he states in the preface, it has no claim to originality but professes to be no more than a compilation of the most modern theories on the diagnosis, treatment and prognosis of mental disorders. In his review of mental deficiency, Dr. Pacheco obviously follows the lines laid down by Tredgold. Unfortunately, there is a good deal to be said against the views of Tredgold. On theoretical grounds it is, of course, tempting to conjecture that some fundamental weakness of the brain or nervous system may produce the many manifestations that are designated as neuropathic, and that this weakness may be transmitted biologically. This concept of Tredgold is, however, a very vague one so that it is difficult to conceive what particular defects or diseases it can be made to include. Too little space is devoted to the psychopathology of childhood, especially as regards the many varieties of convulsive seizures to which children are subject. It is not clear why Dr. Pacheco has placed 'phobias' in the section dealing with obsessional states of mind. The more usual place for these is under the heading of hysteria. Dr. Pacheco misses out one of the commonest of the 'phobias', brontophobia, fear of thunder. His translation of the term coprophobia, i.e., fear of excrement, into Church diarrhoea,

may be regarded as rather free. Many persons will find it difficult to accept Dr. Pacheco's statement that, 'any psychopathic state in the parents or grandparents manifests itself as dementia præcox in the offspring at puberty'. In considering pharmacotoxic psychoses, Dr. Pacheco omits one very important variety tolerably common in India, that is the mental derangement caused by datura poisoning. In the chapter devoted to epilepsy, Dr. Pacheco fails sufficiently to emphasize the highly beneficial effects of prophylactic measures in this disease, especially in its early stages, hence it is not strictly true to state that 'the only remedies which influence epilepsy are zinc salts and belladonna'. Dr. Pacheco gives a clear and concise account of the principles of psychoanalysis as well as of the theories of Jung and Adler. Chapter XIV deals with mental hygiene and chapter XV with some of the medico-legal aspects of mental disorders. Then follows a chapter on normal psychology which is adequate for the ordinary student of medicine. The number of printers' errors is an unfortunate feature of the book. The list of errata does not, by any means, include all the errors to be found. Nevertheless, Dr. Pacheco is to be congratulated on having produced a very handy little book which, very rightly, he dedicates to the Ranchi European Mental Hospital, where he has worked for so many years. It is to be hoped that the book will receive a wide recognition in India and elsewhere. At any rate, there is no danger of its meeting with the fate of another book written by another member of the staff of the Ranchi European Mental Hospital, the sale of which was forbidden by the police.

O. B-H.

A STUDY OF MASTURBATION AND THE PSYCHOSEXUAL LIFE.—By John F. W. Meagher, M.D., F.A.C.P. Third Edition. Re-edited and Revised by S. E. Jelliffe, M.D., Ph.D. 1936. Baillière, Tindall and Cox, London. Pp. xii plus 149. Price, 8s. 6d.

THIS small book is now in its third edition. It is a useful and simple presentation of the subject which might be read by all medical men at the outset of their careers, because in the average medical course masturbation is not dealt with and if a young and inexperienced practitioner is faced with treating and advising in a case of this nature he will probably be at a loss. This book will give him all the information he will need.

P. A. M.

EXAMINATION OF THE PATIENT AND SYMPTOMATIC DIAGNOSIS.—By J. W. Murray, M.D. Second Edition. 1936. The C. V. Mosby Company, St. Louis. Pp. 1219, with 274 illustrations. Price, \$10.00

THE first edition of this book came out ten years ago and the second edition begins with addenda of considerable new material on diagnosis. Clinical medicine embraces a broad field and the general practitioner is often not sufficiently equipped with knowledge to analyse all the symptoms complained of by a patient. This book represents an attempt to simplify his problem by presenting a logical guide for the study of the patient. The author does not claim to present any new facts, but simply to present old established facts in a helpful form.

The book consists of two sections. In the first section he describes a general scheme for history-taking and examination of the patient, and then goes on to deal in more detail in a second part with diseases of single organs or systems of the body.

The book has been written mostly in the form of questions and answers. As regards the plan and arrangement of this work, the subject has been approached from the standpoint of symptomatology. The principle consists of tracing the effect (symptoms) to cause with minute details. Such an arrangement inevitably leads to some repetition, which undoubtedly helps to fix things well in the mind. But repetitions of the same words and sentences in the questions as

well as in the answers are unnecessary. For instance, question 3 on p. 673, 'Is there pain, tenderness and fullness in the epigastrium, accompanied by belchings, nausea and vomiting?' is explained by 'If there is pain, tenderness and fullness in the epigastrium, accompanied by belching, nausea and vomiting, gastritis is present.....'. Such repetitions, if avoided, would reduce the bulk of the book.

Some questions and answers are rather curious or vague. For example, in dealing with diseases of the circulatory system Dr. Murray puts the question 'Is there pain in the pit of stomach, with symptoms of disease of the stomach?' and then gives the explanatory note 'Gastric disease'. On p. 317 the question 'Red tongue?' is answered by 'A red colour of the tongue indicates fever'. Of course, it must be admitted that the relative importance and interpretation of different symptoms is largely a matter of opinion. While dealing with causes of certain clinical conditions the author has included many obscure ones and some important ones have been missed. For example, he states gastric cancer as the cause of bradycardia (p. 102), anxiety as the cause of jaundice (p. 289) and hepatic colic as the cause of enlargement of the spleen (p. 393) but kala-azar has not been mentioned as the cause of splenic and liver enlargement.

The chapter on the examination of blood is rather poor and requires to be worked up in the light of recent views.

There are profuse illustrations, many of which are excellent. The book would be of great help to general practitioners in the interpretation of numerous clinical symptoms.

R. C.

THE SPECIFICITY OF SEROLOGICAL REACTIONS.

—By Karl Landsteiner, M.D. 1936. Charles C. Thomas, Springfield, Illinois; Baltimore, Maryland. Pp. vii plus 178. Price, \$4.00. Post paid. [Available from Messrs. Baillière, Tindall and Cox, London. Price, 18s.]

THIS little book brings within the reach of workers in immunology almost a fabulous wealth of references in an exceptionally small compass.

The references are indicated, generally, serially by small numerals, expanded in footnotes and given at length at the end of each section. By this plan the narrative has been made continuous and concise. For 146 pages of subject-matter there are no less than 1,197 references.

After a short introduction to 'elementary concepts and phenomena of serology' for the benefit of the beginner, the subject has been critically reviewed under five headings: (1) The Serological Specificity of Proteins, (2) The Specificity of Cell Antigen, (3) The Specificity of Antibodies, (4) Artificial Conjugated Antigen, (5) Specific Carbohydrates and Lipoids. That the review will serve its intended purpose of assisting work in immunology admits of no doubt. That the short introduction will inspire beginners may be doubted.

From the narrow limits of medicine the author makes excursions into physical chemistry and biology by a systematic development of argument.

The narrative appears to be rather involved at times, due probably to the fact that the original book was not written in English. Here is an instance:—

'Bacterial types—similar to the individual blood properties in biological significance are the serological types in microbes. While species of bacteria which are distinguishable on morphological and biochemical grounds can, like animal cells of various species, be differentiated readily by serological means the converse does not always hold; frequently bacteria otherwise alike or very similar in many respects and classed in one species exhibit differences and here again their sharpness is striking. Such types have been found in many sorts of bacteria.....'

..... The immunological properties may be the sole criterion for distinguishing the types or be associated with differences in cultural and pathogenic behaviour'

(page 53, para 2). Similar involvements are found on pages 74 (lines 7 to 14), 77 (para 3), 86 (para 2, line 1), and 89 (para 2, second half). It is hoped they will be considered in the next edition.

The size, the paper, the printing and the binding are good. No printers' errors arrest attention.

The book, written by an eminent worker in immunology, should be in the hands of all interested in the subject.

S. D. S. G.

MEDICAL ASPECTS OF CRIME.—By W. Norwood East, M.D. (Lond.), F.R.C.P. (Lond.). 1936. J. and A. Churchill Limited, London. Pp. x plus 437. Illustrated. Price, 18s.

THIS is an interesting book on an unusual subject, but one which many practitioners are frequently called upon to deal with, when they appear in court as expert witnesses.

The first four chapters are devoted to a description of the evolution of the prison system in England and are interesting as they show how advances in scientific knowledge have influenced this development. There is a chapter on attempted suicide with an analysis of all the aspects of the subject illustrated by numerous tables, some of these would be of more value if they had been corrected statistically.

The remaining thirteen chapters are mainly on psychological aspects of crime and the study of different criminal types, but nearly in every case with special reference to prison organization and management. Chapter VII, however, does not come into this category; it is an expression of the widely held and erroneous views that certain cranial, facial and other physical characteristics are a sound basis on which to form an estimate of a person's criminal tendencies.

The author of the book has had a life-long experience of prison work from the medical side and hence his views must be received with respect. It is not a book that can be classed as a necessary possession of a general practitioner but is one which might be read by him with profit, as part of his wider reading on the subject of his profession, and to quote from Sir John Simon in the foreword we commend this book '.....to the attention of all who give serious thought to the problem of the causes and cure of crime'.

P. A. M.

THE DIABETIC LIFE: ITS CONTROL BY DIET AND INSULIN.—By R. D. Lawrence, M.A., M.D., F.R.C.P. (Lond.). Ninth Edition. 1936. J. and A. Churchill Limited, London. Pp. x plus 231, with 15 illustrations. Price, 8s. 6d.

WE welcome again another edition, the ninth, of Dr. Lawrence's book on diabetic life, the predecessor of which, we had the pleasure of reviewing about two years ago.

No fundamental changes appear to have been made in the present edition except that the table of food-values has been changed in accordance with the latest analysis of British foodstuffs by McCance and his colleagues.

There is a small point to which we would like to draw the attention of the author in regard to a statement made on page 9 of the book. Dealing with the incidence of diabetes among races, the author has stated that the Bengalis and other Southern Indian races, who live mainly on rice, are very prone to a mild form of diabetes. From our experience of Indian conditions, we are apt to think that this statement requires modification. We are of opinion that ingestion of an excessive amount of rice, to which some of the Indian races are accustomed, does not by itself act as a factor contributory to diabetes. As a matter of fact it is very unusual to find incidence of diabetes amongst the poor working classes in Bengal who live on an almost entirely carbohydrate diet consisting mainly of rice. It is rather amongst the rich, the intellectual and the leisured classes of the Bengalis, who habitually overeat and are disinclined to any form of physical exercise.

that diabetes (not necessarily of the mild type) finds its readiest victims.

We have no hesitation in saying that the book will be found to be as useful and popular as before.

J. P. B.

DISEASES OF THE NOSE, THROAT AND EAR: FOR PRACTITIONERS AND STUDENTS.—Edited by A. L. Turner, M.D., LL.D., F.R.C.S.E. Fourth Edition, Revised and Enlarged. 1936. John Wright and Sons Limited, Bristol. Pp. xviii plus 473 with 243 illustrations in the text and 21 plates of which 8 are in colour. Price, 20s.

We welcome the fourth edition of the 'Diseases of the Nose, Throat and Ear'. This publication occupies a unique position, representing as it does, not one opinion, but the combined views of the Edinburgh school. Changes have taken place in the staff, which are responsible for certain drastic changes in the present edition. This is essential to the maintenance of progress, and is welcomed more particularly as the book is still under the sympathetic and critical editorship of Dr. Logan Turner.

The whole volume has been brought thoroughly up to date with the addition of much new material and many new illustrations. The omission of details of the Slunder operation is a saving of much valuable space, as the balance of sound opinion never favoured this radical and questionable proceeding; the morbidity from which far outweighed the few successes.

The volume calls for no criticism since it continues to fulfil its primary function, although a future edition might see the discarding of a few of the obsolete nasal section diagrams and the substitution of new and better ones, e.g., figures nos. 36, 37 and 38.

Figure no. 191 on page 331 showing the details of the operation of paracentesis could probably be replaced by another showing a bulging tympanic membrane, and with the knife making the incision from below upwards and backwards, instead of from above downwards and forwards. More stress might be laid on the advantages of laryngofissure as against radium treatment in intrinsic laryngeal cancer until the technic of radium treatment is better known than it is to-day. These are however minor matters and the authors can once more be congratulated on producing a book, which can be thoroughly recommended to all, whether specialist or general practitioner. The price continues to be moderate for a volume of this nature.

OTHER BOOKS RECEIVED

Indian Science of Pulse. Volume I. Compiled in Sanskrit with English translation by Prabhakar Chatterjee, M.A. Published by the author, 172, Bow Bazar Street, Calcutta. (Available from the author.) Pp. 112. Price, Rs. 2-8.

La Question de L'Habitation Urbaine en Pologne Ouvrage Redige Sous la Direction de Jan Strzelecki. Serie de Publications de la Societe des Nations. 1936. No. Officiel: C.H. 1165(c). Geneva.

Abstracts from Reports

SEVENTY-THIRD ANNUAL REPORT OF THE GOVERNMENT CINCHONA PLANTATIONS AND FACTORY IN BENGAL FOR THE YEAR 1934-35

The price of quinine, disturbed by currency questions of the previous two years, steadied down during the year and fluctuations in sterling prices were restricted within narrow limits. The Government rupee price which has been maintained at the same level for a number of years is still well below market but opinion is gaining ground that it might well be related more closely to world prices.

To Government institutions it should scarcely matter at what price they take over supplies from the cinchona department; increased expenditures arising from higher prices would be balanced by a corresponding increase in Government revenues. Public bodies and charitable institutions could, where necessary, be recompensed through subsidies or special discounts. The trade can well afford the market price at which it is already absorbing a quantity of imported quinine which is nearly double of Government's yearly output. Additional revenue by sales to the trade at market rates could be utilized in financing more extended distribution to the really needy and poor who cannot afford quinine however low the price.

The ultimate solution to the quinine problem lies of course in increased production. The existing plantations have during the past three or four years provided abundant supplies of bark compared to their total area. It would, however, lead to a sense of false security to assume that these comparatively large harvests would continue indefinitely. Cinchona is a periodic crop and, with the present restricted acreage available for cultivation, harvests are necessarily of a fluctuating nature, periods of good yields followed by lean years. In fact during the coming year the available harvests will scarcely keep the factory working at full capacity. To ensure a steady supply of bark in fairly large quantities it would be necessary to bring increasing areas under cultivation.

In this connection the writer is of opinion that a detailed survey of the existing plantations leading to a correct estimate of standing cinchona and of probable yields in the future would be of great help in deciding upon a policy of development. Existing methods of valuation and estimating yields have, according to latest reports from plantation officers, proved untrustworthy, leading as they do to contradictory results.

ANNUAL PUBLIC HEALTH REPORT OF THE PROVINCE OF BIHAR AND ORISSA FOR THE YEAR 1934

The death rate appears to have increased from 22.1 in 1933 to 26.0 per mille of population in 1934. The rise in the mortality seems to have occurred from every disease except smallpox. The increase in the number of deaths was chiefly due to a larger number of deaths from cholera and fever under which death rates of 1.5 and 17.8 were reported as against 0.5 and 15.2 in the preceding year.

Malaria is quite common in many of the districts, but in the absence of any arrangement to report correct diagnosis it is not possible to say what percentage of deaths under fevers is definitely due to malaria.

The urban death rates for cholera, smallpox, plague and fevers were lower than those of the rural areas. This is ascribed to a better standard of sanitation in the municipal towns, but the mortality rate from the respiratory diseases still remains higher in the urban areas. The incidence of tuberculosis is reported to be increasing in many of the bigger towns. This disease together with influenza and pneumonia is mainly responsible for the increased death rate from respiratory diseases. Control of tuberculosis particularly in the bigger towns is necessary.

Cholera.—The death rate from cholera rose from 0.5 per mille in 1933 to 1.5 per mille in 1934.

The total number of deaths in 1934 was 57,289 as compared with 17,514 in 1933.

Cholera preventive measures.—With the growth of public health organizations in districts there is rapidly being created in those districts which employ health officers an efficient and well trained staff to deal with outbreaks of cholera as soon as they occur. Twelve district boards continued to maintain health officers with a suitable subordinate health staff. There were as usual fewer demands for extra epidemic doctors to combat cholera from these districts. But when the outbreak became serious and widespread and the district staff were unable to cope with the situation,

full statistical details but arrangements were made to record the results of choleraphage in Muzaffarpur and Purnea districts where this has been exclusively used for the last four years successively. Choleraphage was also used in other towns and districts where cholera broke out in a virulent form during the year, but the detailed figures are available only from a few small areas.

The following statement shows some of the results of choleraphage treatment in districts and towns of the province during 1934:

	Total cases under observation	Total cases treated with phage	Total deaths among phage-treated cases	Total cases not treated with phage	Total deaths among not treated with phage	Percentage of deaths among phage-treated cases	Percentage of deaths among non-phage treated cases
1	2	3	4	5	6	7	8
Muzaffarpur district ..	1,209	866	118	343	203	12.8	58.9
Purnea district ..	144	94	26	50	34	27.6	68.0
Patna city ..	705	422	26	283	79	4.2	27.9
Patna administration committee.	106	63	1	43	5	1.6	11.6
TOTALS ..	2,164	1,445	171	719	321	11.8	44.6

temporary epidemic doctors had to be detailed from this department. Demands for epidemic doctors were numerous from the districts which have no permanent health organizations. Forty-five such epidemic doctors were detailed to assist the local bodies to combat cholera epidemics. Besides, at the request of the civil surgeon, Monghyr, a medical officer of health of the cadre was temporarily appointed as the health officer, Monghyr district board, as soon as cholera assumed serious proportions in the district, to control the epidemic.

Stocks of disinfectants such as bleaching powder, permanganate of potash and also kaolin for use for the treatment of cholera cases are kept in reserve by the district boards. If required, the civil surgeon requisitions for these disinfectants and drugs from the director of public health; the local bodies also get supplies of these disinfectants from Government in cases of emergency. Government also maintain a large stock of cholera vaccine at the vaccine depot, Namkum. The superintendent, vaccine depot, is generally asked by telegram to despatch the vaccine immediately wherever it is required in the province. The number of doses of cholera vaccine issued has steadily increased and from 1928, 240,000, 656,300, 731,000, 666,510, 241,235, 458,822 and 749,305 doses were supplied each year up till 1934. This preventive measure is getting more and more appreciated and now hardly any objection is raised to its use even in the remote villages. There are now indications to show that people of their own accord offer themselves for inoculation at the approach of the cholera season.

The findings of the previous three years in favour of choleraphage were put to further tests and experiences gained from the extended application of phage during the widespread cholera epidemic in the province this year appear to support the favourable results obtained in previous years.

Owing to the limited staff and preoccupation of most of the medical officers in the earthquake and flood affected areas this year, it was not possible to compile

Smallpox.—The total number of deaths from smallpox during 1934 was 30,310 as compared with 42,674 in 1933. The mortality rate for the year 1934 was 0.8 against 1.1 in the preceding year. From 1925 to 1933 the case mortality from smallpox rose high during 1925-26 and 1933-34 in this province. The lower death rate of smallpox in 1934 is what would be expected to follow the epidemic wave during the previous year.

Primary vaccination is carried on extensively in all the districts and is compulsory in the municipal areas but wholesale vaccination and revaccination are deemed essential for the prevention of the occurrence of this disease.

It is a known fact that vaccination prevents outbreaks of smallpox but still the rate of mortality from this disease tends to show sharp rises at times in this province. This is due to the fact that a large number of children escape even primary vaccination and thus remain unprotected. Besides, the immunity conferred by vaccination passes off within six to seven years. It is therefore quite clear that so long as vaccination and also revaccination are not made compulsory throughout the province, the incidence of smallpox will continue. The vaccine lymph manufactured at the vaccine depot, Namkum, is supplied throughout the province free of cost.

Plague.—Five thousand, four hundred and eleven deaths occurred from plague in the province during the year under report as against 1,635 in the preceding year. The mortality rate for the year 1934 was 0.1 as compared with 0.04 in the previous year or one-half of the decennial average (0.2). During the year under report an upward trend in the mortality curve was recorded but the incidence remained mostly confined to the endemic foci.

The usual measures of rat destruction, inoculation and evacuation followed by disinfection of floors and lower portion of the walls of the infected houses with kerosene oil emulsions were carried out. Government epidemic doctors were also made available for plague duties in the affected areas. 46,105, 40,897, 9,315 and 1,189 anti-plague inoculations were performed in the

districts of Saran, Muzaffarpur, Darbhanga and Champaran, respectively.

Fairs and festivals.—The Snan and Rath Jatra festivals were held in Puri on the 27th June and 13th July, 1934. Seventy-five thousand pilgrims visited Puri during the car festival. Five sub-assistant surgeons were deputed and one temporary medical officer was appointed by the Puri municipality for the occasion. The town was divided into six sanitary wards and each ward was put under the charge of a medical officer. The sanitary arrangements and preventive measures against cholera were undertaken as usual. Two hundred and seventy-five public lodging house and dharamshala wells were regularly treated with cholera-phage during the mela period. About 1,550 private wells were once chlorinated before the mela and subsequently treated with phage when required. All the railway station wells as well as those along the Jagannath trunk road and in Bhubaneswar and Sakshigopal towns were regularly treated with phage during the mela period.

Out of the 29 important wells used for drinking-water supplies, 5 were fitted with petrol pumps with overhead tanks and taps and 9 with hand pumps by the engineering branch of the public health department. Of the remaining 15 wells, 5 were fitted with hand pumps with overhead tanks and taps and 10 with only hand pumps with cooly guards, at the cost of the municipality. Special arrangements were made for prompt reporting of the cases of infectious diseases occurring in dharamshalas, lodging houses and private houses by the house owners and medical practitioners. Ambulance carts were posted as usual at different places for the prompt removal of cholera patients.

Anti-cholera inoculations were carried out, chiefly among the residents of Puri, before the mela. Sixteen thousand, five hundred and twenty-six anti-cholera inoculations were performed as against 38,384 in the preceding year. In view of the encouraging results obtained by the use of cholera-phage in recent years in the province, cholera-phage was extensively used on this occasion and the operation of anti-cholera inoculation was restricted to the permanent inhabitants of the town and to those pilgrims who offered themselves to be inoculated. From the 26th June all cholera contacts were treated with cholera-phage. Cholera-phage was also distributed freely among the pilgrims through the drinking water. Sealed tubes of cholera-phage were also supplied to the Puri cholera hospital to be used for treatment. Cholera had been prevalent in the town since January 1934. It threatened to become serious in April when on one particular day 20 cases were reported. It is gratifying to note that, although cases of cholera were occurring at the time in the district and also in most parts of India from where the visitors had been largely drawn, the incidence of cholera in the mela area did not assume high proportions. The total number of cholera cases reported during the car festival was 95 against 89 of the preceding year, of whom 93 were admitted in the cholera hospital and 2 were treated by private doctors. There were 14 deaths among these patients against only one in the previous year.

The Sonepur fair, the biggest fair in India, officially opened this year on the 17th November, lasted for a fortnight. Three lakhs of people visited the mela during this period. About a lakh and a half of pilgrims assembled on the bathing day, that is on the 21st November, 1934. Special sanitary arrangements, as in the previous years, were made by the public health department in conjunction with the district board authorities. All the wells in the mela area, numbering 65, were dewatered and chlorinated twice before the mela commenced and they were regularly phaged during the mela period. The main supply of drinking water was through the deep tube wells fitted with pumps and overhead tanks from which it was distributed by means of pipes and standposts throughout the mela area as last year. Three new taps in addition to four in the preceding year were put up in Bailhatta

(cattle market). This provided ample water supply in the area, and no one was found drawing water from the Mahura and Mahi rivers which were made unfit for drinking. Sixty-one trench latrines were provided and a special isolation hospital was put up for the treatment of cases suffering from infectious diseases. Three medical officers of health of the public health department were detailed for mela duty and the whole area was divided into three health units and each unit was placed in charge of a medical officer of health. Only one case of cholera was reported from the mela area. He was removed to the temporary isolation hospital where he was successfully treated.

Epidemic dropsy.—An outbreak of epidemic dropsy occurred in the Manbhum district in September 1934. Eighteen thanas out of 21 thanas in the Sadr subdivision were affected. Two hundred and ninety villages showed the disease and 5,499 attacks and 839 deaths were reported from the affected areas. The better-class people who own land and who eat rice which has been parboiled, husked and stored for at least eight months were found to be the chief victims. The labouring classes who are paid daily wages in paddy appeared to have remained practically free. Only in one instance a servant was found to be attacked, but on enquiry it was ascertained that the man was eating the same food cooked for his master whose family was infected with the disease.

ADMINISTRATION REPORT OF THE MYSORE HEALTH DEPARTMENT FOR THE YEAR 1934

Bureau of epidemiology and communicable diseases.—
(a) *Malaria stations.*—Experimental control of malaria by the use of paris green was continued in the three malaria stations at Nagenahalli, Mudigere and Hiriya. Paris green manufactured locally was tested with satisfactory results.

(b) *Hookworm control.*—Hookworm treatment continued to be given in the dispensaries in the districts of Shimoga, Kadur, Hassan and Mysore, the total number of patients treated during the year being 15,911 against 16,894 during the previous year.

(c) *Guinea-worm control.*—The investigation of the biological control of guinea-worm disease by means of fish was continued in the Chitaldrug district. In all 500 patients suffering from the disease were treated. The number of deaths from plague and smallpox during 1934 was 5,890 and 4,521 respectively, while fevers accounted for 56,502 deaths, the corresponding figures for the year 1933 being 6,984, 2,801 and 51,370, respectively. The total number of anti-plague inoculations and vaccinations done during the year was 181,584 and 317,073, respectively.

Rural health unit, Mandya.—Free distribution of quinine by the special malaria staff which was started in 1932 continued till the close of the year. A total of 5,501 vaccinations and 6,333 anti-plague inoculations were done in the unit area during the year. The two midwives attached to the unit visited 2,935 maternity cases in addition to conducting 85 labour cases.

Bureau of health education.—The assistance received from the Rockefeller Foundation towards the propaganda work of the bureau having ceased at the close of the year 1933, the whole expenditure of the bureau has since been borne by Government. Forty-seven articles on health subjects were published in newspapers, while posters and leaflets on plague, smallpox, soil pollution, bore-hole latrines, malaria, filth diseases, hookworm, water and fly were printed in large numbers and freely distributed. One hundred and twenty cinema shows were given, the total number of persons that attended these shows being about 75,000.

Bureau of laboratories.—(a) *Public health institute.*—The total number of specimens examined in the institute during the year was 9,065 in the bacteriological section, 676 in the chemical section and 657 in the medico-legal section against 9,107, 705 and 707 respectively during the previous year. Orders were issued

prescribing the procedure for sending articles for medico-legal examination.

(b) *Vaccine institute*.—During the year, both lano-line and glycerine lymphs were prepared and issued, the total quantity issued being enough for 339,104 and 50,315 cases respectively. Investigation is stated to have been undertaken about the occurrence of cases of smallpox among persons who had been protected by means of vaccination not long before. The result of this investigation should be reported to Government early. The total income and expenditure of the institute was Rs. 24,692 and Rs. 21,589 against Rs. 24,975 and Rs. 19,769 respectively in the previous year.

Bureau of vital statistics.—The total number of births during the year was 117,302 against 117,920 during the previous year. The computed birth rate was 17.74 per mille of population against 17.99 in 1933. The highest birth rate was returned by the Bangalore district (21.27) and the lowest by the Chitaldrug district (13.26).

The total number of deaths reported during the year was 113,591 against 106,009 during the preceding year, showing an increase of 7,582, which is stated to be due to increase in deaths under fevers. The computed death rate was 17.18 per mille of population against 16.17 in 1933. The total number of deaths among children of less than one year of age was 14,226 against 11,733 in the previous year.

Bureau of sanitary engineering.—The activities of the bureau continued as in the previous year. Thirteen water supply schemes and four drainage works were completed.

The state of public health was generally good. There was a decline in the incidence of plague and the state was almost entirely free from cholera. Smallpox showed a tendency to rise but this was anticipated and the steps taken to check the spread of the disease were adequate.

The Indian Red Cross Society (Mysore State Branch) and other voluntary organizations continued to do useful work.

ANNUAL REPORT OF THE C. M. S. MISSION HOSPITALS, SRINAGAR AND RAINAWARI, KASHMIR, FOR THE YEAR 1935

This is the first year since 1882 that a report has been issued from these hospitals without a Neve having been in charge for at least part of the year. We give below a few abstracts showing that the valuable work done by this organization is being continued as energetically as ever.

Our staff, consisting as it does of about 70 members, doctors, nurses, assistants, compounders, dressers and servants, has ministered to the needs of some 2,000 inpatients, men, women and children, representatives of every community, caste and creed to be found in this great state, and also to travellers coming from far beyond its borders.

During the summer one of the periodic epidemics of cholera broke out in the main valley of Kashmir and would in all probability have become one of appalling magnitude but for the energetic and extraordinarily efficient preventive measures taken by the state medical department through which the epidemic was limited to one of comparatively small dimensions. The chief means of prevention was the inoculation of practically the whole population of the valley with anti-cholera vaccine and it is stated that no less than one million, four hundred thousand inoculations were performed. In this work our hospital was able to take a part, which was appreciated by the state medical authorities as evidenced by a letter which we received from the Director of Medical Services, a copy of which is given below.

'I am writing to thank you on my behalf and that of the medical department of His Highness' Government for the splendid assistance and co-operation given by you and your staff during the recent cholera

epidemic, which very materially assisted in the wonderful results obtained. I shall be most grateful if you would kindly convey my appreciation to all the staff working under you'.

[These hospitals depend largely on voluntary subscription, therefore they are grateful for subscriptions and any of our readers who would like to feel that their money is being well spent may send donations to the superintendent of the mission hospital, Srinagar.]

Correspondence

EPIDEMIOLOGY OF MALARIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—With the help of records supplied to me by Dr. S. C. Sen Gupta, the resident doctor of Hope Tea Estate in the Bengal Duars, I have been able to determine that malarial infection may be conveyed by mosquitoes there during each of the months of September, October, November, and April, and with regard to the other months in one or both of the months December and January, February and March, May and June, and July and August. The material utilized was the record of the birthdays of the infants born on the estate and the date of their first attack of malaria, properly confirmed by the microscope.

The result of the analysis was, after all, only to have been expected, for in the low plains there are no new infections in the hot weather because it is too hot, and in the hills no new infections in the cold weather because it is too cold, so in some intermediate region it follows that one should find new infections at all seasons, as has now been established.

Such records then afford a valuable and cheaper guide to the period, if any, when relaxation of prophylactic measures may be permitted, than do mosquito 'infectivity surveys'. It is hoped to submit shortly details of the method of analysis.

Yours, etc.,

C. STRICKLAND, M.A., M.D.,
Professor of Medical Entomology.

SCHOOL OF TROPICAL
MEDICINE, CALCUTTA,
22nd May, 1936.

INTESTINAL TUBERCULOSIS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I am glad Dr. A. Roy Chowdhry has taken interest in my article on intestinal tuberculosis which appeared in the February number of the *Indian Medical Gazette* and has raised some questions on the observations made by me in the article. It is by such discussions that improvement in the medical science will take place.

Dr. Roy Chowdhry must not forget that my article dealt mainly with intestinal tuberculosis secondary to the disease in the lungs and I certainly believe that the diagnosis of secondary intestinal tuberculosis can be made earlier than was the case some years back.

It is admitted that there is no pathognomonic sign of intestinal tuberculosis but a careful consideration of all the signs and symptoms should help us in forming an opinion whether a 'phthisical' patient is suffering from intestinal complication or not. While ulceration in the small bowel produces constipation, it may produce 'spasm' also. As a result of this spasm there may be a temporary retention of the barium meal proximal to the spastic portion with resultant dilatation and segmentation. By the same reflex mechanism, sufficient spasm of the small intestine may result in gastric retention. This retention of the barium meal higher up in the gastro-intestinal tract ought to create

Service Notes

APPOINTMENTS AND TRANSFERS

COLONEL I. M. MACRAE, C.I.E., O.B.E., V.H.S., is appointed Honorary Physician to the King, 21st January, 1936, vice Major-General T. G. F. Paterson, C.B., D.S.O., I.M.S. (Retd.).

The Viceroy and Governor-General has been pleased to make the following appointments on His Excellency's personal staff:—

To be Honorary Surgeon

Colonel W. J. Powell, C.I.E., vice Colonel I. M. Macrae, C.I.E., O.B.E., vacated. Dated 21st April, 1936.

To be Officiating Surgeon

Lieutenant-Colonel H. H. Elliot, M.B.E., M.C.
Lieutenant-Colonel W. P. Hogg, D.S.O., M.C., an Agency Surgeon, on return from leave, resumed the charge of his appointment of Residency Surgeon, Mewar, with effect from the forenoon of the 19th April, 1936.

Lieutenant-Colonel R. C. Clifford, M.C., D.S.O., is appointed to the post of Civil Surgeon, Simla West, with effect from the 22nd April, 1936.
Lieutenant-Colonel C. Newcomb, Principal and Professor, Medical College, Madras, is appointed to officiate as Surgeon-General with the Government of Madras, with effect from the 23rd April, 1936 (afternoon), vice Major-General Sir Frank P. Connor, granted leave.

Lieutenant-Colonel N. Briggs is appointed Director of Health and Prison Services, Sind, with effect from the 29th April, 1936 (forenoon).
Lieutenant-Colonel B. H. Singh made over charge of the Burdwan Jail to Dr. H. C. Sen on the afternoon of the 11th May, 1936.

Major G. Verghese is appointed as Director of Health and Prison Services, Orissa, with effect from the 27th April, 1936 (forenoon).
The services of Captain H. S. Waters are placed permanently at the disposal of the Government of Bombay, with effect from the 21st January, 1935.
The services of Captain H. J. Curran are placed temporarily at the disposal of the Government of Bihar, with effect from the afternoon of the 7th May, 1936.

To be Lieutenants (temporary commission)

Ivan Harold Benjamin Ghosh. Dated 5th December, 1935.
Konnath Siva Rama Menon. Dated 13th December, 1935.
Inder Singh Wasdev. Dated 27th December, 1935.
Zahurul Hasan Khan. Dated 3rd January, 1936.
Abdul Ghafoor Khan. Dated 9th January, 1936.
Thein Maung. Dated 29th March, 1936.

PROMOTIONS

Brevet-Colonels to be Colonels

A. J. H. Russell, C.R.E., K.H.S. (Supernumerary). Dated 29th January, 1936.
H. H. Thorburn, C.I.E. Dated 4th March, 1936.

Lieutenant-Colonel to be Colonel

J. Taylor, D.S.O., V.H.S. (Supernumerary). Dated 4th March, 1936.
The promotion of Lieutenant-Colonel J. L. D. Yule, to the rank of Major/Lieutenant-Colonel is ante-dated to 7-10-26/7-10-34. He qualified for accelerated promotion on 30th June, 1935.

Majors to be Lieutenant-Colonels

G. A. Khan. Dated 23rd March, 1936.
H. H. Elliot, M.B.E., M.C. Dated 5th April, 1936.
D. Clyde. Dated 16th April, 1936.

LEAVE

Major-General Sir Frank P. Connor, Kt., D.S.O., K.H.S., Surgeon-General with the Government of Madras, is granted provisionally leave on average pay for 3 months

suspicion in our minds about the tuberculous condition of the intestine in a case of pulmonary tuberculosis. The importance of x-ray evidence lies in hyper-motility combined with filling defects and when they are present along with abdominal signs and symptoms in a case of active pulmonary tuberculosis, a diagnosis of intestinal tuberculosis may safely be made. Of course, it requires a good deal of experience to interpret the films correctly.

A very interesting discussion on the subject of intestinal tuberculosis took place not long ago in the Tuberculosis Association in London and I suggest to Dr. Roy Chowdhry to read the summary of the discussion published in the February issue of the *Tubercle*. I take this opportunity of correcting a misprint that has occurred in my article. Under the heading Laboratory Diagnosis 'allevium' has been misprinted in place of the word 'albumin' (Triboulet test).

Yours, etc.,

Y. G. SHRIKHANDE, B.Sc.,
M.B., B.S., T.D.D. (Wales).

KING EDWARD VII SANATORIUM,
BHOWALI, U. P.,
23rd May, 1936.

PARALYSIS AFTER MEASLES

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR.—I invite your attention to a case of 'Multiple Paralysis following Measles' by Dr. Nur Mohammad of Sahiwal dispensary published in the March issue of your *Gazette*.

I wish to point out that he has not said anything about the throat examination of the case. He is content to mention 'sore throat' only which cannot possibly exclude diphtheria.

We know that diphtheria sometimes complicates measles especially in children and paralysis of the soft palate is an important sequel of diphtheria. Shortly after the child is also noticed to be weak in legs and unable to walk any distance or the knees give way on standing for a short time. In many cases the paralysis does not go beyond this stage and in a few weeks the muscles recover their power completely.

In my opinion the 'Paralysis following Measles' might be due to 'Diphtheria Complication'.

Yours, etc.,

MOHAMMAD FAIZULLAH MINHAS, M.P.L.
MIANI DISPENSARY,
SHAHPORE DISTRICT
(PUNJAB).

DRUG ADDICTION IN INDIA AND ITS TREATMENT

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Ref.:—My note on the cure of opium habit with lecithin diet published in your *Gazette* dated August 1935.

It is stated in the above note that '.....soyabean lecithin when administered in daily doses of 60 to 90 "grains" produces spontaneous gradual discontinuity in the use of opium'. 60 to 90 grains is a typographical error for 60 to 90 grammes. My attention has only recently been drawn to this error by a correspondent. Would you kindly publish this correction?

Yours, etc.,

R. E. WRIGHT, C.I.E.,
LIEUTENANT-COLONEL, I.M.S.,
Superintendent.

GOVERNMENT OPHTHALMIC
HOSPITAL, MADRAS,
25th May, 1936.

and 17 days, combined with leave on half average pay for 3 months and 3 days, with effect from the 23rd April, 1936 (afternoon).

Major S. L. Patney has been granted by the High Commissioner for India an extension of leave on half average pay for 2 months.

RETIREMENTS

Lieutenant-Colonel R. B. Lloyd. Dated 15th April, 1936.

Captain A. M. Fraser. Dated 9th April, 1936.

Notes

THE MODERN TREATMENT OF GONORRHOEA GONODERM

(*Gonococcus Filtrate Corbus Ferry*)

GONODERM (Parke, Davis and Co.) is the bouillon filtrate of the gonococcus. It contains the soluble specific extra-cellular gonococcus toxin described by Clark, Ferry and Steele in their 'Studies of the Properties of a Bouillon Filtrate of the Gonococcus', published in the *Journal of Immunology* in 1931. In the Parke-Davis research laboratories it was found that cultures of the gonococcus in a special medium, after a few days' incubation, exhibited a heavy pellicle on the surface of the medium. Tests of the clear broth beneath the pellicle showed that it contained a specific soluble toxin which differed from the ordinary toxic substances recognized as endotoxins in that it was capable of stimulating the formation of specific antitoxin. The sterile bouillon filtrate from young cultures contains this extra-cellular toxin in sufficient concentration to promote, on being injected intradermally, antigenic stimulation of definite curative value in gonococcus infections.

Gonoderm is clinically tested before release and is now available to every physician; it is indicated for the treatment of all stages of gonorrhoea and its complications in patients of both sexes, including infants and children.

Gonoderm is intended for use only by intradermal injection and in order to measure the small doses a tuberculin syringe should be used. A special intradermal needle is available for use with a tuberculin syringe. Gonoderm should be carefully stored in a cool place, preferably in a refrigerator.

Dosage:—Wide clinical use has demonstrated that careful attention to dosage and regularity of treatment are essential if good results are to be obtained. Adults whether men or women having acute gonorrhoea should be given initially by intradermal injection from 0.02 c.cm. to 0.05 c.cm. and in chronic cases from 0.05 c.cm. to 0.1 c.cm. The size of the subsequent doses is based on response to treatment and skin reaction. Overdose should be and can be avoided by noting the presence or absence of signs and symptoms indicative of constitutional intolerance. Intradermal injections are given at intervals of from 6 to 8 days.

A booklet containing full details of the application of Gonoderm in gonorrhoeal infections will be gladly supplied on application to Messrs. Parke, Davis and Co., P. O. Box 88, Bombay.

PARKE, DAVIS AND COMPANY'S HEMOPROTEIN (BROOK'S)

HEMOPROTEIN (Brook's) is a definite mixture of protein fractions for non-specific therapy but its intravenous, intramuscular or subcutaneous injection does not give rise to disagreeable and unnecessary reactions, such as fever, chills, sweating, which hitherto have been considered inseparable from non-specific protein therapy. It has been conclusively proved that unpleasant sequelae following the injection of a protein are not indicative of therapeutic efficiency. In fact, these sequelae, made it impossible for non-specific

therapy to be employed in a number of conditions in which reaction-producing agents are contra-indicated.

Some of the commoner indications for Hemoprotein (Brook's) are: (a) allergic diseases, such as asthma and hay-fever; (b) blood disorders; (c) gastro-intestinal conditions, such as ulcer of the stomach or duodenum, and catarrhal colitis; (d) general and specific infections, including pelvic puerperal abscess, furunculosis, sinusitis, otitis, acute conjunctivitis, etc.; (e) rheumatic diseases; and (f) respiratory infections.

RADIO-MALT (B. D. H.)

RADIO-MALT is a palatable combination of Radiostoleum (vitamins A and D) with measured amounts of concentrated extracts of yeast and malt containing vitamins B₁ and B₂. In Radio-Malt these vitamins, which are lacking most often in the normal dietary, are exhibited in constant standardized amounts and in those balanced proportions which have been proved in clinical practice to be the most suitable for prophylactic purposes. It is standardized for its content of vitamins A, 'B' and D in accordance with accepted methods.

Uses

Radio-Malt finds an important place in preventive medicine; its use is not restricted to any particular age or sex, and for this reason it has a wide application in general practice. It is prescribed as an extra dietary product. It is employed as a mild prophylactic; patients who require more intensive treatment should be given Radiostoleum.

Radio-Malt is acceptable to patients of both sexes and of all ages and conditions, the infant and even the invalid being tempted by its pleasant flavour.

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Original Articles

A NOTE ON THE EXPERIMENTAL INFECTION OF DOGS WITH DRACONTIASIS*

By V. N. MOORTHY, B.Sc., M.B., B.S., D.P.H., D.T.M.
and
W. C. SWEET, M.D., D.P.H.

VARIOUS workers have attempted to induce guinea-worm infection in laboratory animals but Leiper (1906), who succeeded in giving this infection to monkeys, and Issajev (1935), who succeeded with dogs, have been the only ones to report success. The first part of this note concerns the finding of four fully mature female nematodes in the external tissues of a dog approximately one year after it had received feeds of cyclops infected with guinea-worm embryos and of such embryos freed, after full development, from infected cyclops.

The dog concerned, one of 28 experimental animals, was purchased in Bangalore (a non-endemic area), at the approximate age of two months, and was taken to a field laboratory in Chitaldrug, Mysore State, the centre of an extensive endemic dracontiasis area. At about the age of five months, and after preliminary tests and examinations, it was given its first feed of 22 infected cyclops on 6th May, 1935, subsequent to a period of eighteen hours' starvation; the cyclops were taken up in a pipette and squirted well back into the dog's throat. The next day the dog was allowed to lap water containing infective larvæ dissected out of 20 infected cyclops, and this was repeated on the 13th May, except that the released larvæ were squirted into the throat from a pipette. On the 14th May, 21 infected cyclops were slightly injured by pricking into the body cavity and were squirted into the throat. Subsequent feedings, using one of the above methods, were given on the 21st, 22nd, 23rd and 25th of May. This first series of infective feedings consisted of a total of 123 infected cyclops and the fully developed larvæ released from 40 infected cyclops. These cyclops were infected in the laboratory, about three weeks before being given in feedings, by guinea-worm embryos obtained by the use of ethyl chloride spraying of newly opened blisters in human cases of dracontiasis.

When guinea-worm embryos again became available early in 1936, and since the dog had shown few signs of infection, it was given two further feedings of 110 guinea-worm-infected cyclops on the 19th of March and 19th of April, 1936.

*The work here reported was done with the support and under the auspices of the Government of Mysore and the International Health Division of the Rockefeller Foundation.

Subsequent to the eight infective feedings given in May 1935, the dog remained well until early in August of the same year when it developed digestive troubles and pustular skin eruptions. It recovered after injections of one c.cm. of omnadin on three successive days, followed by a one c.cm. milk injection on the fourth day, and remained apparently completely healthy until the following April.

This dog had an eosinophile count of 6.1 per cent on 10th March, 1935, and of 19.3 per cent on 9th April, 1936. Its highest eosinophilia was 35.0 per cent on 8th August, 1935. A control dog has had a maximum of 9.0 per cent eosinophilia.

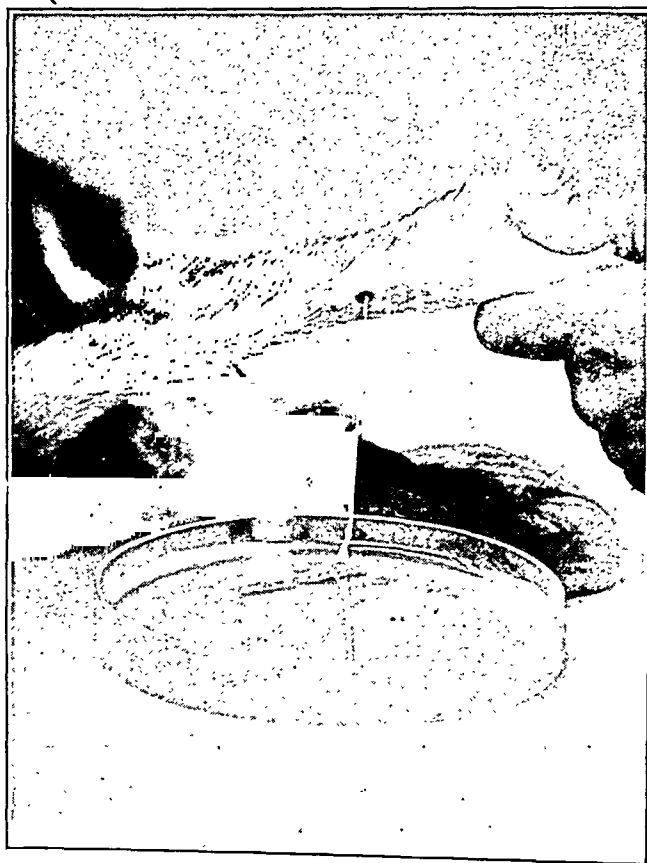


Fig. 1.—Left hind leg of living infected animal showing a guinea-worm appearing from an opening in the left hind foot.

On 20th April, 1936, which was 350 days after the first and 331 days after the last feed of infected cyclops in 1935, the dog became noticeably restless, refused food and was found to have a rectal temperature of 104°F. It was continually licking its hind left foot and during the afternoon a pea-sized blister was found about two inches above this paw. After opening the blistered area and applying pressure from above downwards, there was an initial bloody discharge. When the same area was sprayed with ethyl chloride, there was an exudation of a white milky fluid which on examination was found to contain living worm embryos.

Further spraying of the area and pressure from above downwards made possible the extraction of about six inches of a nematode worm. This was rolled up on a piece of cotton before a cold pad was applied. On 27th April, when nearly three-fourths of the worm had been extracted by continuous winding and application of cold pads, the animal pulled off all the dressings on the leg and with them tore loose the extracted portion of the worm. The wound healed without complications (figure 1).

On 27th April, 357 days after the first infective feed in May 1935, a second worm was recovered from the left front foot. For about a week before the appearance of this worm the animal appeared to be having acute pain in this leg and about two days previously a definite swelling was noticed on the dorsum of the

extracted. After drawing out about three-fourths of the worm, the tail was found imbedded in the deeper tissues of the thigh in such a position that an extensive operation would have been necessary to release it, so the extracted portion was rolled on a piece of cotton and a cold bandage applied. On 1st May the dog again pulled off all the dressings and tore loose the extracted portion of the worm. The wound later healed completely without complications.

Also, on the 29th April, a small blister of the size of a bean was seen on the left side of the scrotum. On opening the blister and spraying the area with ethyl chloride, a small number of live embryos were collected. The worm itself had not yet emerged from the opening of the skin. Careful examination revealed the presence of two more worms in tumours on the

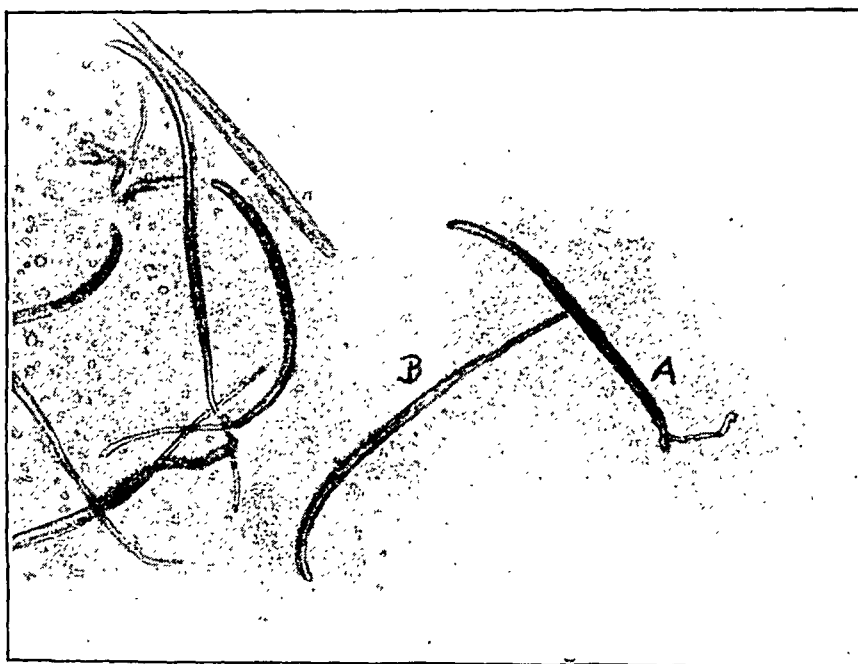


Fig. 2.—Embryos from the dog guinea-worm. A and B are two types of embryos found in human guinea-worms. $\times 80$.

second digit of the left front paw. When this swelling was the size of a big lime it was aseptically opened. There was a profuse bloody discharge and, on applying pressure at the sides, about ten inches of the worm emerged. No embryos were recovered upon spraying with ethyl chloride and the mouth portion of the worm was found to have undergone decomposition. With the application of cold bandages for three days, the remainder of the worm was recovered uninjured.

The presence of a third worm being felt as an oblong flattened tumour about four inches in length and $\frac{1}{8}$ inch in breadth (feeling to the touch like a skein of thick twisted cord), on the inner surface of the proximal third of the right thigh, an incision about one inch in length was made along the length of the swelling on 29th April, 1936, and the worm was partially

left thigh and chest. The dog was alive on 16th May, 1936.

The worms recovered from this dog are structurally identical, in mouth and tail parts, with specimens of fully-mature *Dracunculus medinensis* obtained from human cases in the Chitaldrug district and the embryos from the dog guinea-worms cannot be distinguished from those obtained from human guinea-worms. Further, the embryos from the dog worms were infective to cyclops and went through the same cycle of development in the body cavity as do embryos from human worms. Embryos from the dog worms were of the two types previously described in human cases (Moorthy and Sweet, 1936) (figure 2). It was noted that the number of embryos obtained from the guinea-worms in the dog was much smaller than that recovered from worms in human cases. This

may have been due to the development of these worms in an unusual host.

In view of the history of this dog and the identity between the worms and embryos recovered with those from human cases, the conclusion that this is a case of *Dracunculus medinensis* infection of the dog is justified. A control dog kept under the same conditions as the animal reported on has shown no signs of such infection, so the cause of the infection in this dog may be taken to be the infecting feeds of cyclops containing fully-developed guinea-worm embryos.

Worms recovered in post-mortem examinations of dogs

The second part of this note concerns certain nematode worms found in the tissues of four dogs dying after feedings of cyclops infected with guinea-worm embryos. Since 1934 three series of pups, 28 in all, have been given feedings of infected cyclops by methods similar to those described for the one of these dogs reported on above, with seven exceptions. Four got their infected cyclops through a stomach tube, one received a subcutaneous injection of about one thousand fresh guinea-worm embryos obtained directly from a worm in a patient, and the sixth got a similar injection of about 150 live embryos dissected out of infected cyclops after full development; the seventh, no. 28, received, by squirting into the throat from a pipette, a total of 88 naturally-infected cyclops found in the step-well of an infected village. Two extra puppies were maintained as controls, being kept under the same conditions and in close association with some of the infected animals.

At intervals varying from one to four months after the first infective feeding, all the experimental animals became ill with digestive disturbances and pustular eruptions of the skin. Some recovered with the omnadin and milk

injections but 24 died in from two to five months after infection, usually with nervous symptoms or in convulsions. Since one of the control dogs died with this train of symptoms, further experiments are required to prove that they were related to the previous infective feedings.

Post-mortem examinations were done on all these dogs but nothing of interest to this experiment was found until the last four autopsies. In the connective tissues of these four dogs, two types of nematode worms were found. It is now felt that such worms were possibly present in some of the other dogs but were missed on account of lack of knowledge as to just where and how to search.

These last four examinations were done on dogs numbered 19, 20, 21 and 28. Dog no. 19 got a total of 90 infected cyclops and 60 fully developed larvæ squirted into its throat from a pipette on the 5th, 10th and 21st of October 1935; it died on 3rd February, 1936, just 105 days after its last infective feeding. Dog no. 20 got by the same methods a total of 90 infected cyclops and 50 released larvæ, on 10th, 11th and 21st October and on 14th November, 1935; it died on 8th March, 1936, which was 115 days after its last feeding. Dog no. 21 was given 81 infected cyclops and 51 released larvæ on 10th, 18th and 21st October, 1935, and it died 144 days after the last date given. Dog no. 28 received its 88 naturally-infected cyclops on 19th, 22nd and 23rd January, 1936, and died 67 days later on 30th March.

Estimations of the eosinophile percentages in the blood of all dogs were made every two weeks. The average percentage of eosinophiles of the four dogs autopsied last was 6.1 before the infective feedings began and 24.0 at the last examination before death, the maximum final count being 34.0 per cent in dog no. 20. The smallest increase was in dog no. 28, which

TABLE I

Nematode worms found post-mortem in four dogs previously given feedings of guinea-worm larvæ

	Dog no. 19	Dog no. 20	Dog no. 21	Dog no. 28
Number of female worms ..	1	74	18	44
Number of male worms ..	5	17	7	7
Where found	Retro-oesophageal; beneath right scapula.	Right orbit; meninges; retro-oesophageal; thorax; abdominal wall; peritoneal cavity; extremities.	Scalp; retro-oesophageal; thoracic wall; abdominal wall; extremities.	Retro-oesophageal; thoracic wall; extremities.
Total number of infected cyclops and fully-developed embryos fed to dog.	150	140	132	88
Number of days between last infective feed and death.	105	115	144	67
Age at time of infection ..	1½ months	3 months	2½ months	2 months

lived only 67 days after infection, and this was from 4.0 to 12.0 per cent. At no time has the remaining control dog shown an eosinophilia of over 9.0 per cent, its initial count on 18th February, 1935, being 1.4 and the last count on 18th April, 1936, being 4.2 per cent.

period between infection and death, the 51 worms found in the tissues of dog no. 28 were all short; they were, however, of the same two classes as regards structure. Table I gives details for each dog of numbers and type of worm, regions in which they were found, and a

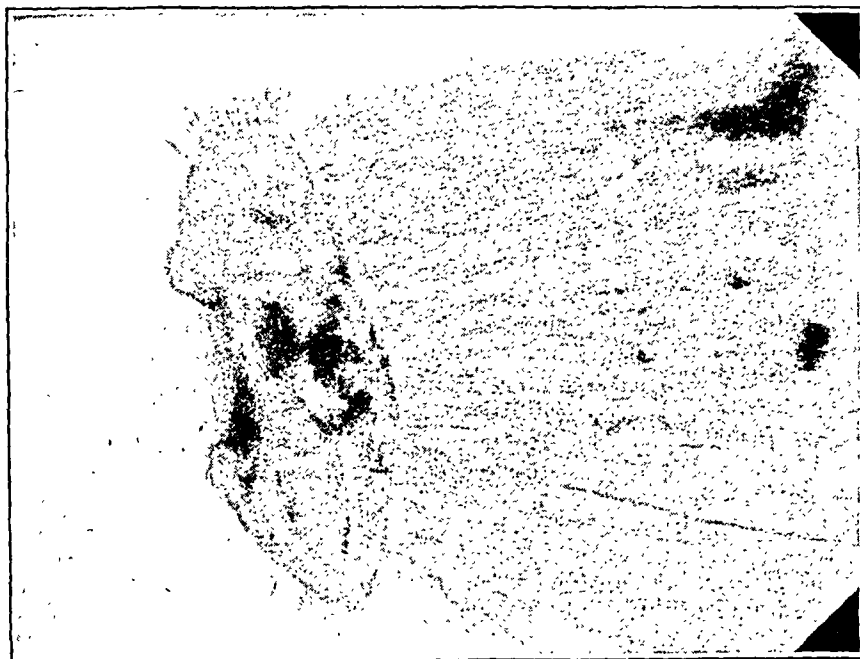


Fig. 3.—Mouth end of female worm found post mortem in dog no. 20. $\times 180$.

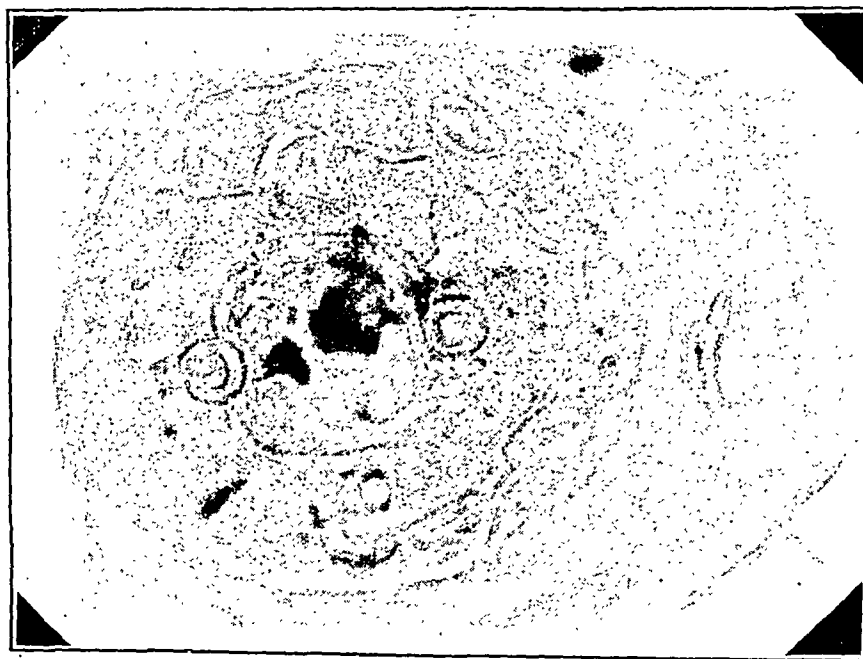


Fig. 4.—Transverse section of mouth end of female worm found post mortem in dog no. 20. $\times 210$.

From the first three of these dogs, 122 nematode worms of special interest were recovered. These could be classed as of two types, a long worm and a short worm, of quite different structure. Possibly due to the shorter

summary of the infection data, with the number of days elapsing between infection and death.

The longer nematode worms are thin and thread-like and varied, before preservation, from 7.0 to 49.0 cm. in length. A dark-coloured

band runs from the anterior third practically to the end of the tail. The anterior end is dome-shaped and the cuticle is noticeably thickened around an oval mouth opening. On either side of the mouth two prominent papillæ

are situated. Posterior and lateral to these, two additional rounded papillæ can be distinguished, about half the size of the more central pair (figures 3 and 4). Another small papilla can be seen in the cervical region. The tail is

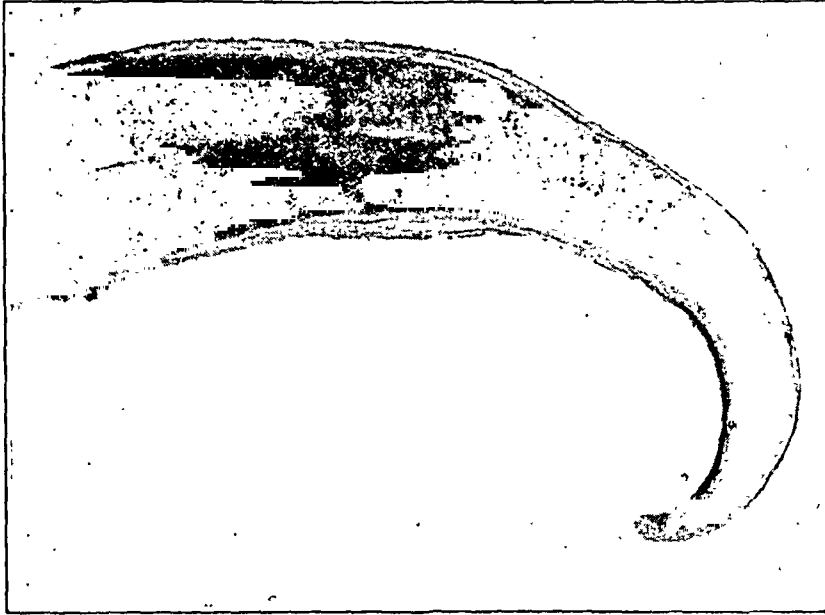


Fig. 5.—Tail end of female worm found post mortem in dog no. 20. $\times 160$.

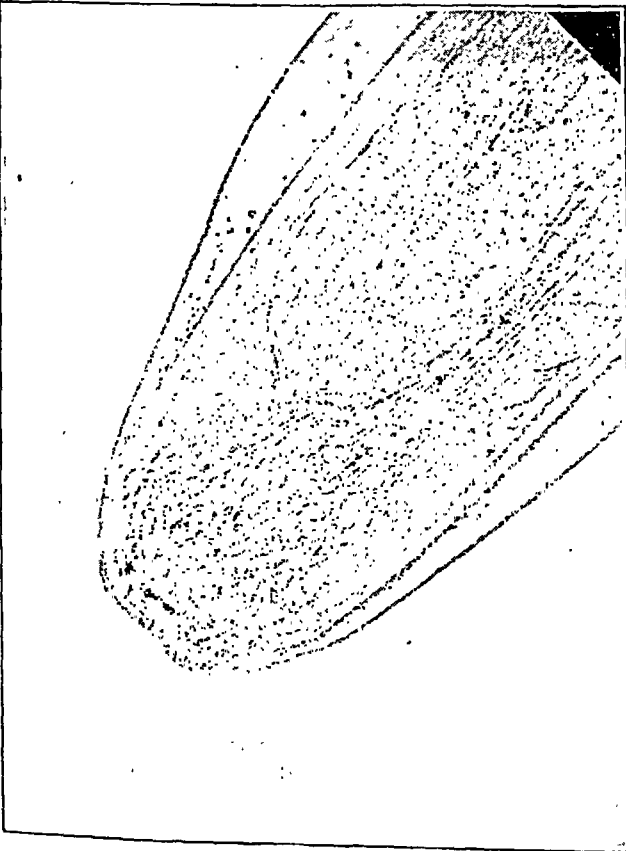


Fig. 6.—Mouth end of male worm found post mortem in dog no. 20. $\times 160$.

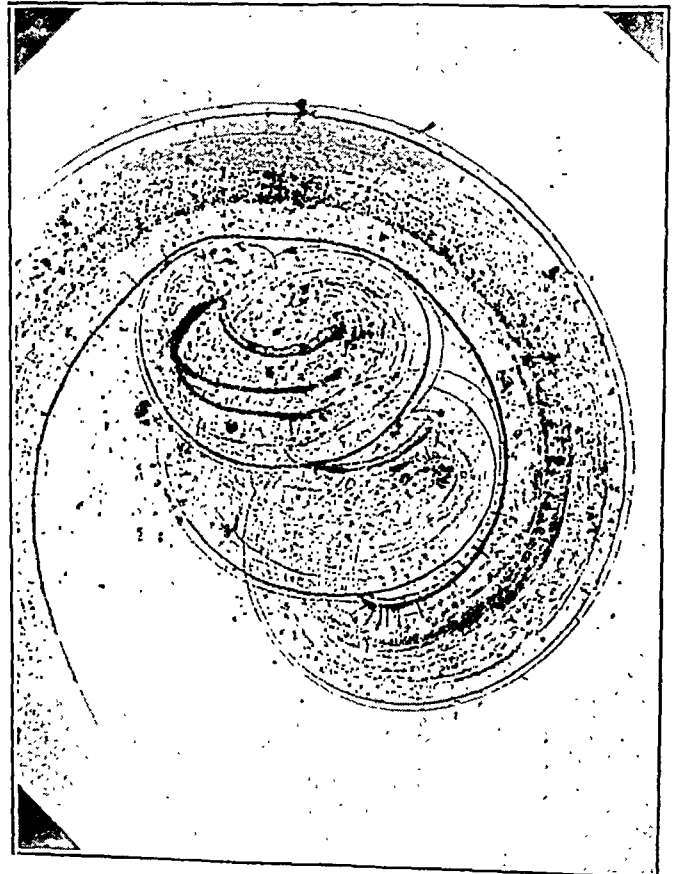


Fig. 7.—Tail of male worm found post mortem in dog no. 20. $\times 160$.

bluntly pointed and curved ventrally (figure 5). Situated 0.6 mm. above the posterior extremity (total length of worm 15 cm.) is the anus.

The shorter worms are also thread-like with a maximum length, before preservation, of 2.4 cm. and a breadth of 0.7 mm. In the case of these worms the dark band starts at about the middle of the body and runs to about 0.2 mm. above the tip of the tail. The two central papillæ of the mouth are clearly seen but the lateral ones are not as prominent as in the female (figure 6). The papillæ in the cervical region are present. The tail is spirally curved ventrally and has two openings with thick labiæ, the anterior one being, on the average, 0.2 mm. above the tip of the tail and the posterior just beyond it. Between these openings and the tail tip are two globular papillæ,

(figure 8). The other type of worm in this dog is the same structurally as the male worm of the other dogs, with the characteristic mouth end, spirally curled tail, and two equal spicules.

In view of the history given of these four dogs, and of the finding of adult guinea-worms in another dog, it is suggested that the longer of these two types of worms are specimens of immature female *Dracunculus medinensis* and that the shorter is the more mature male. Full confirmation of this suggestion will have to await more adequate facilities than are at present available for a detailed study of the external and internal structures of these worms. It may be of interest to point out that, if the suggestion that these are male and female guinea-worms is correct, the report confirms

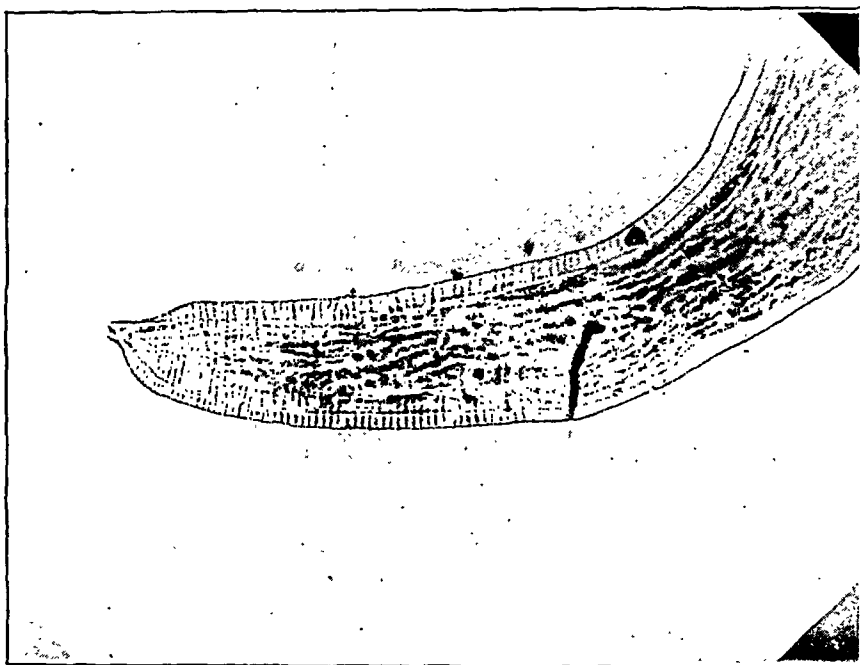


Fig. 8.—Tail of young form of female worm found post mortem in dog no. 28. $\times 160$.

apparently not pedunculated. The tail itself is bluntly pointed and ends in a sharply curved hook. Two brownish spicules, of about equal length, start in funnel-shaped anterior ends and extrude, in sharp points, from the upper of the two openings mentioned. The left ventral spicule averages, in three specimens, 0.55 mm. in length and the right dorsal 0.53 mm. (figure 7).

In the case of dog no. 28, which lived only 67 days after its infective feeding, worms of the same two types were found and in similar situations. These worms, however, are much shorter, varying from 1.5 to 2.4 cm. in length after preservation. In the females, only the two central papillæ can be found at the mouth end and the tail shows the tri-partite ending so characteristic of the guinea-worm embryo after it has undergone its full development in cyclops

Leiper's (1907) finding in a monkey and his view that fertilization of the female guinea-worm takes place in the tissues of the final host and not in the gastro-intestinal tract.

Special appreciation must be expressed for the assistance of Mr. L. N. Rao of the Central College, Bangalore, in taking the microphotographs.

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STUDIES ON THE ACTION OF ANTI-MALARIAL REMEDIES ON MONKEY MALARIA

THE RELATIONSHIP BETWEEN THE CONCENTRATION OF ATEBRIN IN THE CIRCULATING BLOOD AND PARASITE COUNT

By R. N. CHOPRA, C.I.E., K.H.P., M.A., M.D. (Cantab.),
M.R.C.P. (Lond.)

BREVET-COLONEL, I.M.S.

S. K. GANGULY, M.B.

and

A. C. ROY, M.Sc.

(From the Department of Pharmacology, School of
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In a previous paper Chopra, Ganguly and Roy (1935) showed that in monkey malaria no direct relationship existed between the concentration of quinine in the circulating blood and the parasite count at any particular time. The highest concentration of the alkaloid attainable without producing toxic effects produced neither apparent reduction in the number of parasites nor degenerative changes in them. On the other hand, in the majority of cases there was an apparent increase in the number of parasites per c.mm. of blood after administration of quinine. The action of quinine on *Plasmodium knowlesi* does not, therefore, appear to be direct, but is probably synergistic to other mechanisms set up in the body.

The next point in our investigation was to study the action of atebtrin on similar lines, as we thought it would be of value in making a comparative study of the two drugs. In clinical practice the effect of atebtrin in controlling the fever and reducing the number of parasites has been observed by a large number of workers. On referring to some of the work done here we find that Napier and Das Gupta (1932) showed that the average duration of fever was less than two days after the first administration of atebtrin by the oral route, and that a mean dosage of 0.525 gm. was necessary to bring down the temperature. Chopra, Das Gupta and Sen (1933) reported that parasites disappeared from the peripheral blood by the third day; in a heavy malignant tertian infection Chopra and Sen (1934) found that the parasites had completely disappeared after a dosage of 0.7 gm. of atebtrin. Blaze and Simeons (1935), on the other hand, in a trial of atebtrin by the parenteral route in the Ceylon epidemic contend that atebtrin orally has no action either on the parasites or on the fever within the first three days of its administration. So far as plasmodium infection in monkeys is concerned, it has been shown by Chopra and Das Gupta (1933) that the action of atebtrin is much more rapid and immediate than quinine and that some advantage is gained by giving the drug either by intramuscular or intravenous injections. It was therefore our object to study the changes

in the concentration of atebtrin after parenteral administration along with the changes in the number of parasites in the blood, with the idea that it might throw some light on the mode of action of the drug on plasmodium infection in monkeys.

Quinine is a drug which has been used clinically for centuries, but still we possess no exact knowledge regarding its action on the malarial parasites; our knowledge regarding the action of atebtrin is perhaps more incomplete. The chief difficulty encountered in our experiments was that there was no recognized method for the estimation of atebtrin in the blood. Chopra and Roy (1935) have recently evolved a suitable method of estimating minute quantities of atebtrin in the blood. This method has been found to give fairly accurate results in estimating minute differences in the concentration of atebtrin solutions. Further experience with the method has enabled them to simplify the procedure by introducing minor modifications the details of which will be published shortly.

Experimental

Experiments were carried out on monkeys of the species *Silenus rhesus*, infected with strains of *Plasmodium knowlesi*, by subcutaneous injection of heavily parasitized blood from another monkey. The weights of these animals varied from 3 to 5 kilogrammes. Atebtrin was administered both by the intramuscular and the intravenous routes, and the concentration of the drug in the blood and the parasite counts were determined at stated intervals of time, such as half an hour, 2 hours, 6 hours, 24 hours, 48 hours and so on. In some of the monkeys a single intramuscular or intravenous injection was given while in others atebtrin was given for 2 to 4 days, one injection being given daily. The results of these experiments are given in the table.

Discussion of results

A perusal of the table will show that in monkeys I to V atebtrin was given intramuscularly and in VI to VIII intravenously.

Concentration of atebtrin in the blood.—In the intramuscular series the highest concentration of atebtrin in the blood is attained within half an hour of the administration of the drug. The concentration in specimens of blood drawn 2 and 6 hours after the injection shows a gradual fall; after 24 hours no atebtrin can be detected in the circulating blood and, if there be any, the quantity is negligible. In monkeys I and V the concentration obtained in the blood at different intervals was higher than in other monkeys of the intramuscular series.

Though there may be variation in the concentration of atebtrin attained in the blood in different cases the presence of atebtrin in the circulating blood was in no case detected after 24 hours. This shows that atebtrin disappears quite rapidly from the peripheral blood after intramuscular injection. By the intravenous

TABLE

Showing parasite count per c.mm. and the atebirin concentration in the blood expressed in mgm. per 100 c.cm. at stated times in plasmodium-infected monkeys

Serial number	Before injection	PERIODS AFTER INJECTION						Route and number of doses	REMARKS
		$\frac{1}{2}$ hour	2 hours	6 hours	24 hours	48 hours	72 hours		
I Parasite count	166,600	285,600	261,800	261,800	Scanty de-generating parasites.	nil	..	0.025 gm. i.m., daily for 2 days.	The monkey recovered.
Atebrin concentration.	..	0.3	0.23	0.15	nil	..	..	..
II Parasite count	173,700	246,540	230,800	203,000	Scanty de-generating parasites.	nil	nil	0.025 gm. i.m., for 1 day.	The monkey recovered.
Atebrin concentration.	..	0.15	0.15	0.10	nil	nil	..	..
III Parasite count	663,000	728,000	570,400	441,000	Scanty de-generating parasites.	Scanty	nil	0.038 gm. i.m., daily for 3 days.	The monkey recovered.
Atebrin concentration.	..	0.25	0.2	0.15	nil	nil	nil	..	
IV Parasite count	255,000	349,300	400,000	400,000	Scanty de-generating parasites.	Scanty	nil	0.02 gm. i.m., daily for 2 days; another dose after 72 hours.	The monkey recovered.
Atebrin concentration.	..	0.15	0.05	nil	nil	..	nil	..	
V Parasite count	1,225,500	1,980,000	..	931,000	319,000	Scanty	Scanty	0.02 gm. i.m., daily for 4 days.	Marked anisocytosis and poikilocytosis 24 hours after the first injection, with presence of normoblasts. Atebrin conc. on the fourth day was nil. The monkey recovered.
Atebrin concentration.	..	0.4	..	0.2	nil	..	nil	..	
VI Parasite count	1,380,000	1,020,000	999,000	1,001,000	384,300	Scanty	..	0.025 gm. i.v., daily for 2 days.	Though the infection was controlled the monkey died after 48 hours. Heart's blood showed very scanty parasites.
Atebrin concentration.	..	0.4	0.3	0.2	nil	nil	nil	..	
VII Parasite count	150,300	204,800	99,200	99,200	Scanty de-generating parasites.	nil	nil	0.02 gm. i.v., for 1 day	The monkey recovered.
Atebrin concentration.	..	0.3	0.3	0.2	0.05	nil	nil	..	
VIII Parasite count	1,372,500	1,300,500	..	1,140,000	910,000	Scanty de-generating parasites.	nil	0.02 gm. i.v., for 2 days	The monkey developed diarrhoea, and hæmoglobinuria on the third day; died the same night. Heart's blood showed no parasite.
Atebrin concentration.	..	0.24	..	0.20	nil	..	..	..

i.m. = intramuscular.

i.v. = intravenous.

route also, the highest concentration was attained within half an hour of the administration of the drug; it showed a gradual fall subsequently, till at the end of 24 hours no atebtrin was detected in the peripheral blood. It is to be noted that the figures obtained for the first six hours after intravenous injection were in the majority of cases higher than those after intramuscular injection. The dose of atebtrin both by the intramuscular and intravenous routes is much smaller than that of quinine, which accounts for its lower concentration in the circulating blood.

From the above experiments it appears that atebtrin, when given by the parenteral route, apparently disappears from the peripheral blood within 24 hours. What exactly happens with the absorbed atebtrin and whether it has any predilection for any particular organ or tissue has still to be worked out.

Mode of action of atebtrin.—Study of this table brings to light some interesting results regarding the changes in the number of parasites in the peripheral blood in relation to concentration of atebtrin. A single injection of atebtrin either by the intravenous or intramuscular route controls the infection. In all these experiments the maximum possible concentration attainable with atebtrin was maintained for about 6 hours, and in the majority of our experiments there was an appreciable decrease in the number of parasites during this period, though the figures obtained after half an hour were somewhat higher. In monkey I the parasite count remained steady; in monkeys II, III, V, VI, VII and VIII there was actual reduction in the number of parasites per c.mm. of blood; in monkey IV, although during the period of observation the parasite count increased, the increase was not marked. In all these cases at the end of 24 hours the parasites were scanty, and they all showed degenerative changes, except in monkeys V, VI and VIII where the initial infection being very heavy (more than 1 million parasites per c.mm.) two injections were necessary to bring it under control.

From the foregoing results it appears that atebtrin in such concentrations as those obtained in the blood after therapeutic doses has a powerful and immediate destructive action on this plasmodium. This is in accord with the previous finding of Chopra and Das Gupta (1933) who showed that usually two doses each of 0.025 gm. of atebtrin, given either intramuscularly or intravenously, are sufficient to control a very heavy infection (up to a million parasites per c.mm.). In this series of experiments, after a single intramuscular or intravenous injection, the parasites practically disappeared from the peripheral blood within 24 hours (monkeys I, II, III, IV and VII); in very heavy infections (monkeys V, VI and VIII) one injection brought down the number of parasites in the peripheral blood to a great extent; after

two injections only a few degenerated parasites were found.

In the present state of our knowledge we are not in a position to say that any direct relationship exists between the concentration of atebtrin in the circulating blood and the parasite count at any particular time, but the following observations are noteworthy. The number of parasites per c.mm. of blood distinctly diminishes in the majority of cases in the first 6 hours, when the concentration of atebtrin in the blood is highest. Within 24 hours the parasites are reduced to a negligible number in spite of the concentration of atebtrin rapidly falling off. It is, therefore, reasonable to state that atebtrin, unlike quinine, has probably a direct lethal action on *Plasmodium knowlesi* *in vivo*. The action of the drug, however, cannot be fully explained by its lethal action alone, as this action commences within a very short time of its parenteral administration and it takes 24 hours to become complete, unless the infection is very heavy.

Summary and conclusions

1. The results of experiments on the concentration of atebtrin attained in the circulating blood at different intervals of time in relation to parasite counts on monkeys infected with *P. knowlesi* are given.
2. These experiments show that after a single intramuscular or intravenous injection, atebtrin apparently disappears from the peripheral blood within 24 hours, and in some cases earlier. The highest concentration occurs between half an hour and six hours after the injection.
3. The number of parasites per c.mm. of blood distinctly diminishes along with the diminution in the concentration of atebtrin. It therefore appears that *in vivo* atebtrin, unlike quinine, may have a direct lethal action on *Plasmodium knowlesi*. The action of the drug cannot, however, be fully explained by its direct lethal action alone, as although the action commences within a very short time of its parenteral administration, it takes 24 hours to bring the infection under control.

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INTRA-UTERINE VACCINIA IN PREGNANT ANIMALS

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THE production of bacteria-free vaccinia virus for general vaccination is to-day of paramount importance, and the first step towards its attainment is to obtain a small quantity of a dermal strain of the virus which is free from extraneous organisms.

Many workers on this difficult problem have evolved methods which are more or less successful, but the fact that so many methods are in use shows that we have no really satisfactory, certain, or easy method of obtaining a bacteria-free vaccinia virus for culture purposes.

Filtration of fresh pulp ground in broth, glucose broth or hormone broth is perhaps the easiest method, and with selection of the original 'seed' lymph gives very satisfactory results. But Mills, Shibley and Dochez (1928) and Garrod (1928) have succeeded in isolating small filter-passing anaerobic bacteria from nasal washings in broth, though seldom from saline washings. This method is, therefore, not above suspicion and most workers prefer the very lengthy and tedious process of purifying the virus by intra-testicular passage through four or five rabbits. This method is very satisfactory, but entails much labour and great care, as during grinding the testicular emulsions are liable to be contaminated.

Yaoi and Kasai (1929) have elaborated a lengthy method for the purification of vaccinia virus by absorption on kaolin, while Behrens and Morgan (1932) have devised two methods—(a) the iso-electric precipitation of the cells by means of weak acetic acid, and (b) the addition of Brewer's negatively-charged aluminium gel which repels the virus, and mechanically carries down the tissue fragments. Though successful, these methods are lengthy and have their drawbacks.

It was while experimenting to reduce the cost of the manufacture of vaccine lymph that I made, what I think, an important observation.

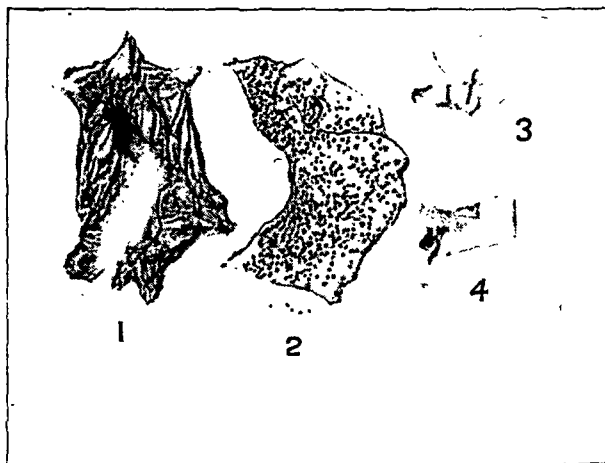
At this institute, the Java method of vaccinating a large area on the animal (all the abdomen and right side), and slaughtering it before scraping is practised, this having proved the least expensive, as yields are large, fewer animals are used, no pain is given the animal during scraping, which is carried out after death and a post-mortem examination is held on each carcass.

With a view to obtaining larger yields, some fully-grown animals were tried, and during the autopsy on a large female buffalo (B. 19) on 27th March, 1935, it was found to be pregnant.

This buffalo had been vaccinated with calf lymph on the abdomen and right side and gave a yield of 628 grammes from the skin. The uterus was opened and the foetus removed. I

observed, on examining the inside, that the amnion was studded with small umbilicated vesicles. The uterus was then removed and taken to the laboratory where, after examination, the amnion was carefully dissected out. The foetus was a female nine inches in height at the shoulder, perfectly formed, and without a blemish or sign of a vesicle, but the inside of the amnion was covered with umbilicated vesicles. The foetus was about four to five months old.

No. 2 in the figure shows half this membrane, and the cord, which was unfortunately removed, was attached in the concavity on the left. The vesicles were about one-eighth of an inch in diameter, a little less than one-sixteenth of an inch in height, umbilicated, yellowish in colour, translucent, and with no areola on the surrounding membrane. They were firm in consistency, and easily detached whole by a rub with a finger nail. Some detached vesicles are seen in the photograph just above the figure '2'. Discrete along the outer curve between vessels, they increased in numbers near the larger vessels, and were confluent along the cord up to about three-quarters of an inch from the foetus, where the amnion joins the skin. Here they ceased altogether, and not a vesicle was to be found on the foetus.



No. 1.—Part of amnion and cord of buffalo no. 5 (about 7 months' pregnancy). Note confluent vesiculation on the cord and the amnion forming ridges over the larger vessels.

No. 2.—About half of the amnion of buffalo no. 19 (about 4 or 5 months' pregnancy). Note distribution of vesicles—spread out distally, along the curve and becoming confluent over the larger vessels near the cord which was attached in the concavity on the left.

No. 3.—Embryo and amnion of buffalo no. 3 of 1935 (about 2 months' pregnancy). Vesicles are small but can be seen in the photographs by the aid of a lens.

No. 4.—Amnion and cord of a cow no. 1 which was pregnant about three months.

About half the membrane was preserved in ten per cent formaldehyde, and the vesicles from the remainder were scraped with a spatula, and shaken for half an hour in five per cent

carbolic lotion in a centrifuge tube. They were then centrifuged, washed in three changes of normal saline, and stored in fifty per cent glycerine. At the same time, one gramme of these carbolized moist vesicles was ground in a sterile mortar, diluted with normal saline, and the potency was tested by the Calmette-Guerin method, on two rabbits. A one-in-five-hundred emulsion was used, as it was thought that the carbolic lotion and washing would have reduced the potency, but both rabbits showed confluent vesiculation, which is at least equal to the minimum international standard of potency, and the vesicles were like those produced by good dermal lymph.

At a rough estimate, there must have been about twenty grammes of these vesicles had they all been detached from the amnion.

On looking up the literature on the subject, I found that Minervin and Schmerling (1926) found the virus in the placenta after dermal vaccination; Douglas, Smith and Price (1929), after intravenous injections of vaccinia virus, found lesions in the ovaries and uterus.

Ledingham and Barrat (1929) also, after intravenous injections of the virus, frequently noted necrotic lesions in the uterine horns, but I could find no mention of the finding of vaccinia virus in the amniotic fluid, nor of vesicles on the amnion. In fact Belenkyi (1929) states that no virus can be found in the amniotic fluid of rabbits or guinea-pigs and that the smallest capillary loops of the placenta hinder the advance of the virus into the cord, the blood of the offspring and the amniotic fluid.

25th April, 1935. With a view to further investigation, a twenty-day pregnant rabbit (no. 5) was vaccinated on a two-inch square shaved area on the back with calf lymph, and four days later showed innumerable vesicles. She was killed by an intravenous injection of air, and opened with aseptic precautions.

One foetus was found, and the amniotic fluid was drawn off aseptically, after which the amnion was dissected out, but showed no vesicles even under a lens. However on 29th April another rabbit (no. 7) was taken and three areas on its back were shaved. These were vaccinated with the following material from rabbit no. 5:—

(1) A piece of chorion, after rinsing in normal saline ground in a mortar.

(2) A piece of amnion, after rinsing in normal saline ground in a mortar.

(3) Amniotic fluid.

3rd May. All three vaccinated areas showed numerous small vesicles, each surrounded by a small areola. In the area vaccinated with amniotic fluid the vesicles were most numerous.

All three specimens in broth and on agar proved sterile.

25th April. A pregnant cow (Cl.) of about three months' pregnancy, was vaccinated in the ordinary way, on the abdomen and right side with dermal lymph from a buffalo.

30th April. She was washed, slaughtered and scraped in the ordinary way, and gave a yield of 181 grammes.

At the post-mortem examination, the uterus was removed whole and taken into the laboratory, where the amniotic fluid was tapped aseptically through a branded area, after which the uterus and chorion were removed, and the amniotic membrane opened. Inside, it showed small vesicles one-eighth to one-sixth of an inch in diameter, but they were softer and more

adherent to the membrane than were those of buffalo B. 19.

No. 4 in the figure shows the distribution of the vesicles was the same as found in B. 19, discrete distally, more numerous near the larger vessels, becoming confluent near the base of the cord and along it, up to the skin of the embryo, where they ceased, and none were found on the embryo.

The embryo was a well-developed male, three inches at the shoulder and four and a half inches from the nose to the root of the tail, and approximately three months old.

A piece of the amnion was put in fifty per cent glycerine, and the remainder with the cord was preserved in ten per cent formaldehyde.

30th April. Rabbit no. 8 was vaccinated on the right side with a piece of amnion of Cl. emulsified, and on the left side with amniotic fluid of the same. Four days later both sides showed many small vesicles, but the amniotic fluid showed more vesicles than the amnion emulsion.

The sterility of the amniotic fluid was proved aerobically and anaerobically. The pH was 8.4. It was then used for inoculating the chorio-allantoic membranes of four fertile eggs, and produced good vesicles in three, the fourth chick being found dead.

18th July, 1935. The amniotic fluid of Cl. which had been stored at 6°C. was well stirred and its potency tested by injecting rabbit no. 44 with 0.1 c.cm. intradermally on one side, and the other side was vaccinated by scarification with 0.5 c.cm. amniotic fluid.

22nd July. Intracutaneous injection—good induration and the other side many good vesicles.

4th May. A twenty-day pregnant rabbit (no. 9) was next vaccinated on the back with B. 19 intra-uterine vaccine which had been stored in normal saline for five weeks at 6°C. Four days later two large and four small vesicles were seen. The rabbit was killed, and the amniotic membrane was removed aseptically, and ground in a sterile mortar with normal saline. On 8th May rabbit no. 10 was vaccinated with a little of this emulsion.

12th May. Six vesicles had developed. The amniotic fluid was not tried in this case.

18th May. A seventeen-day pregnant rabbit (no. 15) was vaccinated with calf lymph on the back over an area of about nine square inches.

On 23rd May as a result of the vaccination numerous good vesicles were present, and she was killed.

Three young were found, and the amniotic fluid was collected into a sterile test tube with a sterile pipette. One amniotic membrane was dissected aseptically and put in a little normal saline. No vesicles were found on this or the other two amniotic membranes.

22nd May. Potency was tested by vaccinating rabbit no. 16 on the right side with a small piece of emulsified amnion and on the left side amniotic fluid. Four days later both showed many small vesicles.

4th June. Rabbit no. 21 (nineteen-day pregnant) was vaccinated with 1 c.cm. of a 1/1,000 dilution of a calf lymph, and four days later showed numerous vesicles. She was killed, and six young were found. The amniotic fluid was collected aseptically into a sterile test tube, amounting to about 8 c.cm. exclusive of some which was lost.

The amniotic membranes were very carefully examined under a low power of the microscope, but no vesicles could be found, and gentle scraping under a lens with the edge of a pair of scissors showed no deposit.

The sterility of the amniotic fluid was proved aerobically and anaerobically.

8th June. For comparative purposes and as intra-uterine virus by the scarification method had so far produced mild or normal vesicles and reactions, the potency of this amniotic fluid was tested by Groth's method, using dilutions from one in ten up to one in thirty thousand on rabbit no. 25, and injecting 0.1 c.cm.

of each. Three days later there was definite induration in the 1/10, 1/100 and 1/1,000 dilutions, but this had subsided by next day.

28th June. Twenty days after Groth's test rabbit no. 26 was tested for immunity, and both it and rabbit no. 35, as control, were vaccinated on the back, each with 1 c.cm. of a 1/1,000 dilution of buffalo lymph as for Calmette-Guerin potency test.

2nd July. Rabbit no. 25 showed 1.5 vesicles per square cm., while the control rabbit no. 36 gave five vesicles per square cm. Some immunity had, therefore, been conferred by the injection of 0.0111 c.cm. of the amniotic fluid of rabbit no. 21.

2nd July. The amniotic fluid of rabbit no. 21, after twenty-four days' storage at 6°C., was used for inoculating the chorio-allantoic membranes of three fertile eggs which had been incubated for eleven days.

6th July. Two of the eggs, after four days' further incubation, were found dead though not putrid, but the third was living, and the chorio-allantoic membrane showed three small vesicles near the site of inoculation. A piece of this membrane was ground with a small quantity of normal saline, and rabbit no. 42 was vaccinated with it on the left side, and four days later showed many vesicles.

11th June. The amniotic fluid of rabbit no. 21 was also used as an inoculum for culture on chick embryonic tissue in Tyrode's solution, 0.3 c.cm. of amniotic fluid being inoculated into 100 c.cm. of the medium.

15th June. After four days' incubation rabbit no. 30 was vaccinated with a little of this culture, and produced many vesicles.

28th June. Thirteen days later this rabbit was tested for immunity, and both it and a control rabbit no. 36 were vaccinated with 1 c.cm. of a 1/1,000 dilution of a buffalo lymph, as for the Calmette-Guerin potency test.

2nd July. Rabbit no. 30 showed half a small vesicle per square cm., and these were drying, whereas the control rabbit no. 36 gave a result of five vesicles per square cm.

Rabbit no. 30 therefore showed partial immunity.

10th June. An albino buffalo (B. 3) was vaccinated with calf lymph, and five days later was slaughtered and scraped in the usual way. The yield was 601 grammes of pulp.

During the post-mortem examination, she was found pregnant. The uterus was removed whole and taken to the laboratory where the amniotic fluid was drawn off aseptically, after which the uterus, placenta, and chorion were removed, and the amnion with the cord and embryo were preserved in ten per cent of formaldehyde.

No. 3 in the figure shows this specimen. The embryo is a male one and three-quarter inches at the shoulder, and four and a half inches from the nose to the root of the tail.

The amniotic vesicles are small and their distribution the same as was found in the other examples.

The sterility of the amniotic fluid was proved aerobically and anaerobically. The pH was 8.8. Its potency was tested by Groth's method, using undiluted amniotic fluids 1/10, 1/100 and 1/1,000 and injecting 0.1 c.cm. of each intracutaneously into rabbit no. 31 on 15th June.

19th June. The undiluted amniotic fluid had produced some induration, but no necrotic centre, the 1/10, a slight induration, and the 1/100 and 1/1,000 were negatives.

Thirteen days later this rabbit was tested for immunity and was vaccinated with 1 c.cm. of 1/1,000 dilution of an ordinary buffalo lymph on the shaved back as for the Calmette-Guerin potency test.

2nd July. It showed 2.85 vesicles per square cm., whereas the control rabbit no. 36 showed 5 vesicles per square cm. The injection of 0.111 c.cm. of B. 3 amniotic fluid, thirteen days previously, had produced some immunity.

23rd July. B. 3 amniotic fluid was also used as an inoculum (0.3 c.cm. per 100) for cultures of vaccinia

virus on chick embryonic tissue in Tyrode's solution. After four days' incubation, rabbit no. 45 was vaccinated on the back with a little of this culture, and four days later showed many small vesicles.

20th June. A large female buffalo no. B. 5 was vaccinated on the abdomen and right side with calf lymph, and four days later was dealt with in the usual way, and a yield of 325 grammes was collected. At the post-mortem examination she was found pregnant, and the uterus was removed whole to the laboratory. Three hundred c.cm. of amniotic fluid were syphoned off aseptically into a sterile flask, and the remainder allowed to run off into a bucket. This fluid was turbid, light yellow, and contained many detached vesicles which had probably been rubbed off the amniotic membrane. The pH was 9.0. The uterus was then opened and the foetus removed. It was a female, fourteen inches at the shoulder, and twenty-nine and a half inches from the nose to the root of the tail, and like all the others showed no sign of vesiculation. The amnion showed very many vesicles, and their distribution was the same as in all the others. Of a light yellow colour, translucent, and about one-eighth of an inch in diameter, but coalesced over vessels forming ridges, which were easily detached by a light rub with a finger nail.

No. 1 in the figure is of part of this amnion with the cord, and the massed vesicles on the latter can be clearly seen, though much of the vesiculation has been rubbed off by handling.

The potency of the amniotic fluid was tested on rabbit no. 35 which was vaccinated on the left side cutaneously with it, and on the right side 0.1 c.cm. of 1/1, 1/10 and 1/100 was injected intracutaneously.

Four days later this rabbit showed many small vesicles on the left side, which was flushed, and on the right side the 1/1 injection showed fair induration, the 1/10 a slight induration, and the 1/100 was negative.

4th July. The immunity of this rabbit was tested ten days after the injection, and both it and a control rabbit no. 41 were vaccinated on the shaved back with 1 c.cm. each of a 1/1,000 dilution of buffalo lymph.

Four days later rabbit no. 35 showed seventy small, drying vesicles, while rabbit no. 41 showed innumerable (more than seven hundred) confluent, well-developed vesicles. Rabbit no. 35, therefore, showed some immunity.

The sterility of B. 5 amniotic fluid was tested aerobically and anaerobically.

2nd July. This amniotic fluid was used as an inoculum for growing vaccinia virus on the chorio-allantoic membranes of two eleven-day incubated eggs, and on **6th July** rabbit no. 42, which was vaccinated with a piece of one membrane showing typical vesicles, showed many small vesicles.

Finally, on 3rd September rabbits nos. 61, 62, 63 and 64, which had been previously immunized with large doses of ordinary dermal lymph, were vaccinated with the amniotic fluids of cow no. 1, buffaloes nos. 3 and 5 and intra-uterine vaccine of buffalo no. 19, respectively. They were observed for seven days and all failed to show any sign of vesiculation.

Then on 6th September buffalo no. 16 and on 10th calf no. 14 were each vaccinated on four separate shaved areas with the amniotic fluid of cow no. 1, buffaloes nos. 3 and 5 and the intra-uterine vaccine of buffalo no. 19.

After four days all the areas showed innumerable vesicles, rather smaller than those produced by ordinary dermal lymph in calf no. 14 but indistinguishable from normal in buffalo no. 16.

All the amniotic fluids in these experiments were flaked and their pH left unaltered throughout.

It is interesting to note that these animals, with the exception of rabbit no. 9, were vaccinated with ordinary dermal lymph taken from

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CHOLERA AND INTESTINAL
HELMINTHSBy P. A. MAPLESTONE, D.S.O., D.Sc., M.B., Ch.B., D.T.M.
and

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Fund Association)

CASE reports are fairly common in the literature (especially in India) of ascaris infection accompanied by choleraic symptoms which

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different animals and that it was not a passage of intra-uterine vaccine which had attained a predilection for the uterus. In Burma the loss of potency in transit due to a hot climate renders it necessary that our seed lymph should be really potent and this is maintained by passage through a modified Nijland's cycle of rabbit to cow calf, cow calf to buffalo and back to rabbit—never twice in succession through the same species of animal. No reports of generalized vaccinia in human beings on whom this lymph is used have been received.

Summary.—The amniotic fluid of cutaneously vaccinated pregnant rabbits, cows and buffaloes contains considerable amounts of vaccinia virus four or five days after vaccination. This can be collected easily and is bacteria-free.

On the inner side of the amnion of cutaneously vaccinated cows and buffaloes, vesicles are found which contain large amounts of bacteria-free virus. These vesicles do not occur on the amnion of pregnant rabbits killed four days after vaccination. The foetus from a rabbit, cow or buffalo killed four to five days after vaccination is free from any sign of vesiculation, though the amniotic fluid contains vaccinia virus, as does the amnion itself.

The writer is engaged on further experiments.

My thanks are due to Dr. U. Myat Maung for his able assistance throughout these experiments and to Mr. E. W. D. Jackson, M.C., who so kindly took the photographs of the specimens for me.

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have cleared up after passage of the worms, either with or without specific anthelmintic treatment. The evidence in these reports that the worms were responsible for the frequent bowel evacuations is at best presumptive, and it must be remembered that cholera itself or acute diarrhoea may clear up rapidly whether worms are passed or not, and also that there are many thousands of ascaris infections that never exhibit intestinal disturbance so it seems possible that the suggested ætiological connection between symptoms of cholera and the presence of ascaris is only a matter of false correlation between two very common conditions in India.

We are informed by the officers in charge of cholera wards that ascaris and hookworms are often passed during the acute stage so we thought it might be of interest to see if cholera actually cured intestinal helminth infections. For the purposes of this inquiry samples of stools from 100 cases of cholera in the Campbell Hospital were collected for as many days as the patients were in the hospital. Ninety-nine of the cases had one or more kinds of intestinal worm. The results are given in the table.

TABLE
Showing cases consistently positive

Number of times stools were examined	Number of patients in each group	INCIDENCE OF INFECTIONS		
		Hookworm	Ascaris	Trichuris
2	6	6	2	2
3	33	32	5	9
4	21	19	6	3
5	19	18	8	7
6	7	7	1	2
7	6	6	2	2
9	1	1	..	..
11	1	1	1	1
14	1	1	1	1
TOTAL	95 *	91	26	27

* Negative case omitted.

The stools were all examined by direct centrifugal flotation.

All of the above cases remained positive throughout and in addition there were a certain number that became negative during the course of examination and which may be regarded as possible cures brought about by the attack of cholera.

There were four hookworm infections in this category. One positive for three days and negative for three days, one positive for three days and negative for five days, and two positive for four days and negative for two days. Two ascaris cases were, one positive for one day and negative for three days and one positive for one day and negative for six days. Three trichuris infections were, one positive for five and negative for two days, one positive for one and negative for three days and one positive for three and negative for four days.

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A SIMPLE METHOD OF BRONCHO-RADIOGRAPHY

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FROM August 1935, ever since our attention was drawn to the article by Forestier and Leroux (1935) describing the new pernasal method of administration of lipiodol for visualizing the bronchial tree, we have adopted this method in a modified form in a large number of cases with very satisfactory results. We were successful in all the sixty cases of our series except in one, where the patient, in spite of our best efforts, swallowed the whole quantity of lipiodol not allowing a drop to go into the bronchi. Thrice we tried in the same patient by the same method, but on all three occasions she managed to swallow the oil without any visible or conscious effort at deglutition.

Two months ago we demonstrated this method to one of the doctors from Madras. Since then we are told that the method has been successfully tried in the General Hospital, Madras.

The method consists in 'the oil and previously to it the anæsthetic being injected directly into

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There are two other things that possibly should have been considered to make this inquiry more complete and these are, first, examination of the whole of the stools passed for the presence of worms and, second, egg counts should have been done on the samples collected.

The first of these was not possible for the highly infectious material could not be stored and examined by washing through fine sieves, and the second was not considered worth while, for egg counts at the best of times are only very rough indications of the numbers of worms harboured, and in the present instance the high temperatures of many of the cases coupled with the abnormal condition of the intestinal contents might possibly affect the egg-laying of the worms for the time being, hence egg counts might give an entirely false impression.

The conclusion from this paper is that cholera has very little if any effect in ridding a person of helminth infections.

This work would not have been possible without the help of Capt. Pasricha in arranging for the collection of the stool samples, and of Dr. Flynn for actually collecting them for us, from the Campbell Hospital where, with the permission of the Superintendent, Lieut.-Col. De, bacteriological investigations in cholera are being carried out.

one nostril with an ordinary glass syringe exclusive of any tip or catheter of any sort'.

Technique

The following is the slightly modified technique adopted by one of us (R. V.):—

The patient is made to sit in a chair with the head tilted backwards to an angle of about 45 degrees. The procedure to be adopted is previously explained to him, to gain his confidence. Two strict injunctions are given to the patient, the first being to breathe freely through the nose, and the second not to swallow on



Fig. 1.—Pernasal method—position to inject on the right side.

any account. The patient's tongue is pulled out and held tightly in the left hand with a piece of gauze (figure 1). To assure his breathing through the nose he is told to close his mouth over the protruded tongue. Two c.cm. of 1 per cent cocaine is injected slowly into the nostril. As soon as it enters the larynx the patient becomes temporarily apnœic as the glottis gets closed by reflex action. When the patient breathes again on being instructed to do so, the rest of the solution enters the trachea, causing a violent fit of coughing. He may be allowed to spit out whatever part of the anæsthetic that comes back into the mouth. After five minutes the same quantity of the anæsthetic is injected again. The third installation is done after the same interval. Most of the patients require only three injections for satisfactory anæsthetization which is indicated by the obliteration

of the cough reflex. If this occurs, he is ready for the injection of the iodized oil.

Before injection, the patient is tilted to the side which is to be visualized. If the upper lobes are to be seen, the patient may be asked to lie on the x-ray couch itself, with the neck and the head raised by means of a pillow, the radiograph being taken immediately after.

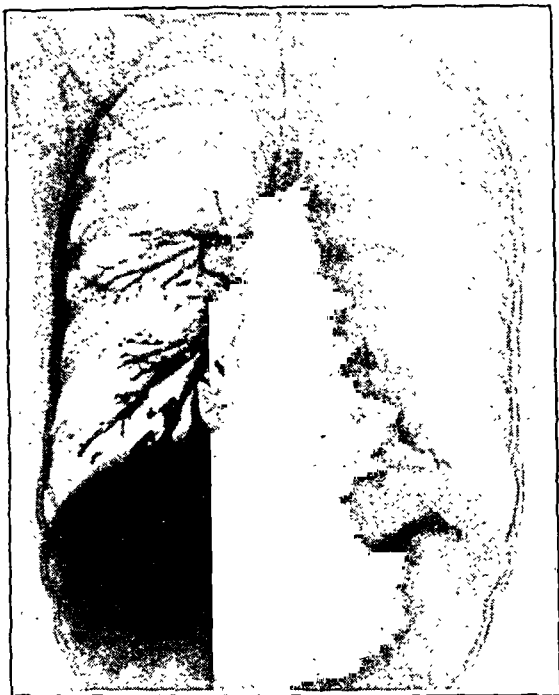


Fig. 2.—Radiograph after lipiodol of the same patient shown in the other picture.

The oil is instilled slowly in the same manner and into the same nostril as the anaesthetic solution was previously injected. The radiograph is taken a minute after the injection is finished.

Advantages

It is quite evident that the method is incredibly simple. We no longer require the paraphernalia concomitant with an operation, as is the case when the crico-thyroid route is chosen for the injection. No special syringes or catheters are required. We need only a 20 c.cm. syringe, a 2 c.cm. syringe both without needles, a piece of gauze, and 1 per cent cocaine solution. There is no danger of injecting the oil into the cellular tissues, nor is there any fear of breaking needles inside the trachea. The method is practically fool-proof. All that might happen is, that the patient may swallow the iodized oil, in which case a stomach wash may be needed.

Recently we have been using neo-hydrol (viscous) (May and Baker) in place of lipiodol as the cost of the former is less and we consider

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A STUDY OF ONE HUNDRED CASES OF DERMATITIS*

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THE syndrome we are about to describe is characterized by erythema, exfoliation and itching, the whole skin surface is not often involved and the condition is rarely fatal. We have decided to call this condition 'pityriasis rubra benigna' as being the most suitable descriptive title and also to distinguish it from pityriasis rubra as generally recognized and which includes the large-scaled type of Wilson and the small-scaled type of Hebra both of which involve the whole skin surface and are said to be often fatal.

This is not a new disease but in the last 30 years or so since the publication of Radcliffe Crocker's book the recognition of this entity seems to have disappeared from the literature and reference to this type of skin disease is only found under various forms of eczema and dermatitis. Crocker in his discussion of pityriasis rubra recognized Wilson's and Hebra's types and emphasized the partial distribution of apparently the same disease in a certain number of people, and he also drew attention to the fact that practically all of these cases recovered, unlike true pityriasis as described by Hebra and Wilson. It is principally to this partial and non-fatal type that the present paper refers for only 23 of our 100 cases showed lesions over practically the whole body and none of them were fatal, a large number were cured and if not completely and permanently relieved at least they were greatly improved. It should be noted, however, that in some respects pityriasis rubra pilaris resembles the condition that is the subject of this study. But the two differ in that hyperkeratosis is an early and characteristic sign of pityriasis rubra pilaris and the individual follicles are specially affected, giving rise to horny plugs which are evident on the skin surface as papules, whereas in pityriasis rubra benigna increased thickness of the epidermis is only found in chronic cases and even in these definite follicular hyperkeratosis is not a prominent feature. Other points of

*Read at the Annual Meeting of the Assam Branch of the British Medical Association, Shillong, March 1936.

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that the visualization of the bronchi is equally good with both.

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difference such as mode of onset, distribution of the lesions and the course of the disease all serve to emphasize the distinction.

Symptomatology

Most of the persons affected seemed to be otherwise healthy and the chief symptom is the intense itching accompanied by erythema and exfoliation. In cases with the dermatitis involving a large area of skin the itching may be so intense as to interfere with sleep and after the disease has lasted for some time the patient may lose his appetite as well, so that from inadequate rest and malnutrition he becomes debilitated and shows signs of nervous exhaustion.

In mild cases there may be only a simple erythema with slight itching, but all degrees of severity are seen from this mild form up to those with definite œdema of the skin, and when the patients have been unable to resist the inclination to scratch there may be considerable exudation of serum.

In practically all cases there is nearly continuous shedding of fine bran-like scales. In two of our cases the scales were much larger like those described in Wilson's type, but they differed from it because the latter is said not to respond to treatment, whereas one of our cases was cured but the other was not much influenced by treatment.

If the disease has persisted for a long time there may be increased pigmentation and thickening of the skin, which in extreme cases becomes lichenoid. The thickened patches are usually circumscribed and are the spots where the disease persists in more or less chronic form in between acute attacks in which much larger areas are involved. The acute extensions clear up completely leaving the chronic thickened patches as before, and often these exacerbations have a seasonal recurrence, appearing at the same time every year.

In some cases the affection may be generalized from the beginning and cover the whole or nearly the whole skin surface in a day or two. These are usually of the acute type and are in our experience rather uncommon, only 23 out of the 100 cases having these characters; it is much commoner to see only one or two areas affected. The flexor surfaces of the knees and elbows or the face and neck are probably the most often affected areas, but the disease may manifest itself on any part of the body. The same patches may become inflamed year after year with complete remission of all signs between attacks, or in other instances there may be a gradual extension of the condition with each succeeding attack, if treatment fails to effect a cure.

In the few instances where we have seen cases in the very early stages, which have subsequently shown typical lesions, we have found that the disease first appears as minute vesicles scattered over an inflamed surface.

The above description may be summarized as follows :—

Acute.—1. Sudden involvement in a previously healthy person of all or nearly all the body surface.

2. Sudden onset of localized patches with no subsequent extension.

3. Sudden extension of the inflammation from localized chronic patches which have been present for years.

Sub-acute.—After first appearing in one or two spots there is a gradual extension involving an increasingly wider skin area, with each subsequent attack.



Acrodermia perstans type affecting the fingers.

Chronic.—The lesions may be localized to the same areas for a long time without subsequent extension.

Age incidence.—Sixty per cent of the cases in our series occurred between the ages of 20 and 40 years, their frequency becoming distinctly less after that time.

The common affection of children usually known as infantile eczema or infantile allergy is usually considered to be caused by food sensitiveness; our experience inclines us to the view that most if not all these cases should be classed as pityriasis rubra benigna as we have been unable to demonstrate specific sensitiveness to special foods in any of the children included in this series, even after the most careful investigation.

Sex incidence.—There were 64 males and 36 females in our 100 cases.

Seasonal incidence.—Seventy-four of our cases became aggravated during the hot and rainy season. This may possibly be brought about by extra dilatation of the peripheral blood vessels in response to heat; this is followed by increased sweating and decreased evaporation due to the humidity, with consequent soddening of the skin and irritation from the products of decomposition of the unevaporated sweat. To these causes might be added the general depression of the body functions, especially those of the endocrine system, which is usually considered to occur in the hot weather.

The above points in aetiology and symptomatology may be summarized as follows:—

Total number of cases 100

Sex—

Male	..	..	..	64
Female	..	..	..	36

Age—

Under 5 years	..	..	..	4
5 to 10 "	..	..	..	2
10 " 20 "	..	..	..	7
20 " 30 "	..	..	..	30
30 " 40 "	..	..	..	30
40 " 50 "	..	..	..	17
Over 50 "	..	..	..	10

Seasonal incidence—

Worse in summer	..	..	74
Worse in winter	..	..	15
Not affected by seasons	..	..	11

Distribution of lesions—

Universal	..	..	23
Generalized not universal	..	..	37
Face only	..	..	2
Face and limbs	..	..	17
Face and body	..	..	4
Limbs only	..	..	12
Mixed	..	..	5

Results of pathological investigations.

Search for evidence of allergy.

Leucocyte count.—A differential leucocyte count with reference to the presence of an eosinophilia was done in 70 cases with the idea that possibly there might be a high eosinophile count without any of the usual causes being present such as one finds in a certain number of cases of asthma.

In classifying these cases as eosinophilic or not we have not made use of the percentage of eosinophiles compared to the total leucocytes as is usually done, but we have used the actual number of eosinophiles per c.mm. of blood as this gives a truer conception.

Group 1.—Those with 1,000 or more eosinophiles per c.mm. There were 23 cases in this group. (With two exceptions in all these cases the eosinophiles were over 10 per cent of the total.)

Group 2.—Those with 750 and 1,000 eosinophiles per c.mm. There were 10 cases in this group.

Group 3.—Those with between 500 and 750 eosinophiles per c.mm. There were 13 cases in this group.

Group 4.—Those with 500 or less eosinophiles per c.mm. There were 24 cases in this group.

We have interpreted these counts as follows: Group 1 represents definitely high eosinophilia, groups 2 and 3 moderate eosinophilia and group 4 no eosinophilia. If groups 2 and 3 are combined it gives, as nearly as possible, one-third of our cases had high eosinophilia, one-third had moderate eosinophilia and one-third had no eosinophilia.



Generalized type (fine scaled).

Evidence of allergen in the urine.—The urine of 61 of the above 70 cases was examined for the presence of proteoses and 20 gave a definitely positive reaction, 10 a doubtful reaction and the remaining 31 were negative. The proteose-positive cases were distributed among the eosinophile groups as follows: In group 1 there were 11 positive and 4 doubtful out of 23 examined, that is the whole group. Groups 2 and 3 which together numbered 23 and of which

17 were examined showed 7 positive and 4 doubtful, and group 4 containing 24 with 21 examined had 2 positive and 2 doubtful. Although the number of positive cases indicates that as a diagnostic procedure the presence or absence of proteoses in the urine, by itself is not of much value, there appears to be a correlation between a high eosinophilia and proteoses.

Praustnitz-Kustner reaction.—This reaction was tested in 7 cases which were specially selected on account of the generalized character of the rash; cases of this type being considered the most likely to show a strong serum reaction. None of them gave anything definite so this evidence of allergy was not further investigated.

usually ascribed to allergic influences was not considered as it was thought the history in this respect might be unreliable as it was highly probable that the early stages of pityriasis would be confused by the patients with the former.

Sugar metabolism.—The skin is an important reservoir for glycogen so it was thought that a generalized dermatitis of the nature of the disease we were studying might interfere with sugar metabolism in general, or conversely that faulty sugar metabolism might account for the dermatitis. The blood sugar of 33 cases was estimated and in all of them the 'fasting' blood sugar content was within normal limits.

Adrenal function.—The influence of endocrine function or dysfunction on the presence or



Patchy distribution in which the axillæ and flexor surfaces of the elbows are affected.

Specific food sensitiveness.—Forty cases were tested for specific dermal sensitiveness to protein extracts (Parke Davis & Co.) of foods or groups of foods commonly eaten, and which were being taken by these patients at the time of examination. There was no evidence of such sensitiveness in any instance.

History of allergy.—Careful inquiry into the histories of all our patients for evidence of familial allergy only revealed 18 with a history of asthma either in themselves or in some other member of the family, and as only 4 of these cases were in groups 1, 2 and 3 in the eosinophilia investigation which together comprised 46 cases, the evidence of relationship of asthmatic history and eosinophilia was not apparent. Urticaria and other skin conditions

absence of many skin diseases is now well established so the adrenal function of several of our cases was estimated. Seventeen cases were examined in this way and 9 were found to be hypoadrenic, 5 hyperadrenic and 3 were normal. Although these results suggest that disturbed adrenal function is present in the majority of cases of pityriasis rubra benigna the fact that some are hyper- and others hypoadrenic makes it at present impossible to define in what way the endocrine system acts, if it acts at all, in helping to produce this disease.

Bowel infection.—In 80 of our 100 cases the stools were examined, from 3 to 6 times if necessary, to exclude abnormal infections either bacterial, protozoal or helminthic and the results are shown in the table.

TABLE
Showing the incidence of bowel infection in 80 cases

Serial number	BACTERIAL							PROTOZOAL		HELMINTHS			
	<i>Bacterium pseudo-carolinus</i>	<i>B. pyocyaneus</i>	<i>B. asiaticus</i>	<i>B. alcaligenes faecalis</i>	<i>B. flexner</i> (atypical)	<i>B. pseudo-morganii</i>	<i>Streptococcus</i>	<i>Entamoeba histolytica</i>	<i>Giardia intestinalis</i>	<i>Trichostrongylus</i>	<i>Trichuris</i>	<i>Ascaris lumbricoides</i>	Hookworm
1	..	..	..	..	..	..	..	..	..	+	..	..	..
2	+	..	..	..	..	..	..	..	..	..	..	..	..
3	..	..	..	..	..	..	..	..	..	..	..	..	..
4	..	+	..	..	..	..	..	..	..	..	..	..	..
5	..	..	..	..	..	..	..	..	..	..	..	..	..
6	..	+	..	..	..	..	..	..	..	..	..	..	..
7	..	..	..	..	..	..	..	..	..	..	..	..	..
8	..	..	..	..	..	..	..	..	..	..	..	..	..
9	+	..	..	..	..	..	..	..	..	..	+	..	..
10	..	..	..	..	..	..	..	+	..	..	..	..	..
11	..	..	..	..	..	..	..	+	..	..	..	..	..
12	..	..	..	..	..	..	..	+	..	..	..	..	..
13	..	..	+	..	..	..	..	..	..	..	..	..	..
14	+	..	..	..	..	..	..	..	..	..	..	..	..
15	..	..	..	..	..	..	..	+	..	..	..	..	..
16	..	..	..	..	..	..	..	..	+	..	..	..	..
17	..	..	..	..	..	..	..	+	..	..	..	..	..
18	+	..	..	..	..	..	..	..	..	..	..	..	+
19	..	..	..	+	..	..	..	+	..	..	..	..	..
20	..	..	..	..	..	..	..	..	..	..	..	+	..
21	+	..	..	..	..	..	..	..	..	..	..	..	..
22	+	..	..	..	..	..	..	..	..	..	..	..	..
23	+	..	+	..	..	..	..	..	..	..	..	..	..
24	..	..	..	..	..	..	..	+	..	..	+	..	+
25	..	..	..	..	..	..	..	+	..	..	..	..	+
26	..	..	..	..	..	..	..	..	..	..	+	..	+
27	..	..	..	..	..	..	..	..	..	..	+	+	+
28	..	..	..	..	..	..	..	+	..	..	..	+	+
29	+	..	..	..	..	..	+	+	+	..	..	..	+
30	+	..	..	..	..	..	..	+	..	..	..	..	..
31	..	..	..	..	..	..	..	+	..	..	..	..	..
TOTAL ..	9	2	2	2	1	1	1	11	2	1	3	3	9

Forty-nine cases had no bowel infection.

It will be seen that there were 47 infections distributed among 31 individuals, the discrepancy being explained by the presence of two or in some cases three different infections in the same person. We have formed the opinion that cure or improvement in the bowel infection, whatever its nature, had considerable influence in assisting or in a few cases of altogether curing the pityriasis. The word 'cure' of course applies especially to those cases suffering from *Entamoeba histolytica* or hookworm infection. In the cases with bacterial infections there was no evidence of agglutinating reaction in the patient's serum against the bacteria cultured from his intestine to show that such infections were having any systemic effect, nor that they had disappeared from the bowel as a result of a course of vaccine treatment that had been given with apparent benefit. Therefore it seems probable that the undoubtedly good results obtained by this method of treatment are more in the nature of non-specific protein

shock than from any specific character of the autovaccine.

We may summarize our experience of the effects of bowel infections in this disease as follows, and from the results of treatment deduce that they play a part in causing pityriasis. Although we can ascribe no specific effect, in our cured cases of pityriasis, to the relief of pathogenic bowel infections there is no doubt that cure of whatever infection is found has a definite value in the treatment.

Histological examination.—Scales scraped from the lesions showed nucleated cells typical of parakeratosis such as is found in any sub-acute or chronic dermatitis.

Portions of skin were removed from 20 cases which were selected with the object of demonstrating the various types and stages of the condition. The histological picture was found to be essentially the same in all, there being only a slight variation in the degree of reaction which depended on whether the case supplying

the specimen concerned was in the acute, sub-acute or chronic stage.

The main pathological change is confined to the sub-epithelial connective tissue. There is vascular dilatation with engorgement of the vessels and occasionally a moderate degree of erythrorrhæxis. There is a zone of cellular reaction containing numerous mononuclear cells, wandering cells, and polymorphonuclear leucocytes, a considerable number of the last being eosinophiles. The zone of inflammation appears to lie superficial to the sweat glands and hair follicles and it extends upwards into the papillæ to the basal layer of the epithelium. In some places the inflammatory exudate has caused thinning of the epithelium from pressure. In some sections there is evidence of rapid multiplication of the prickly cell layer, cells in the deeper parts are degenerated and the horny layer is throwing off scales.



Generalized type (large scaled).

This appearance suggests primary irritation caused by a toxin circulating in the blood and producing acute or sub-acute inflammatory reaction with its attendant vascular changes. The exudate has apparently forced the superficial layers of the epithelium to exfoliate. The reaction differs from lichen planus in that the latter disease shows evidence of limited chronic focal inflammation with some engorgement of the blood vessels and a varying degree of thickening of the epithelium in the affected area.

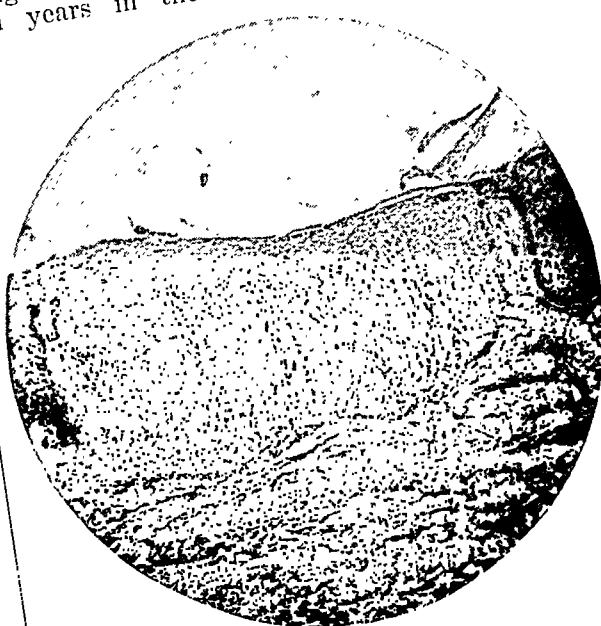
Treatment

As we were unable to find any ætiological factors invariably present it was not possible to formulate a general line of treatment applicable to all the cases, but each case had to be taken separately.

We were able to generalize, however, in the case of bowel infections for we found that appropriate treatment for whatever the pathogenic infection might be (protozoal, helminthic or bacterial) in a few cases was sufficient to bring about a cure without other medication except mild local treatment to the lesions, and in others cure of the bowel infection seemed greatly to facilitate other treatment.

Another fact of general application was that nearly always cases with an eosinophilia not explained by the usual causes (true allergic cases) respond well to arsenic whereas those without eosinophilia reacted better to antimony.

Antimony.—The preparation used was 'Neostibosan' (Bayer) the formula of this is p-amino-phenyl-stibinate of diethyl-amine. This drug has been used at the Calcutta School for ten years in the treatment of kala-azar so



Photomicrograph.
Section of skin from lesion. $\times 80$.
Showing vascular dilatation, subpapillary inflammatory zone and exfoliation of the horny layers.

we had readily available ample information on the dosage, effects and reactions to be expected. It was suggested that in the case of pityriasis rubra benigna its beneficial effect is indirectly due to its causing constriction of the cutaneous blood vessels brought about by its stimulation of the adrenals, and in this way the erythema, exudation and consequent irritation of the skin are controlled. A full course of treatment by this drug consisted of an intravenous injection of 0.2 gramme each dissolved in distilled water, on ten consecutive days. In a few cases that were greatly improved but not completely cured it was found that a second course of the same length and dosage, after an interval of about a month, was well borne and usually effected a cure.

Arsenic.—This drug was more useful in the cases with high eosinophilia. The form of

arsenic we chiefly used was soamin, which we gave hypodermically in doses of two grains dissolved in distilled water at intervals of three to four days (twice a week) to the total number of 10 to 12 injections.

Calcium and parathyroid was sometimes found useful in addition to either arsenic or antimony and were given in doses of calcium lactate 10 grains with parathyroid extract 1/10 grain twice or three times a day.

Protein shock.—Some cases that did not respond to any other form of treatment appeared to be benefited by non-specific protein injections the substance used being chiefly milk either prepared from the fresh article or one of the

Local treatment.—We have not been able to add anything new in the form of local treatment to the many applications usually employed in treatment of dermatitis from any cause, but for the benefit of practitioners we may perhaps briefly outline the treatment we have found most useful.

In the acute stage all possible irritants should be avoided and, in a few, even lotio calamine is not well tolerated at the beginning. Such highly sensitive cases are best treated with applications of sterile olive oil for a few days, and on no account use soap and water. When the acute stage is subsiding calamine lotion can be used, and as dryness and cracking of the skin



Type in which the dorsal aspects of the extremities only are affected.

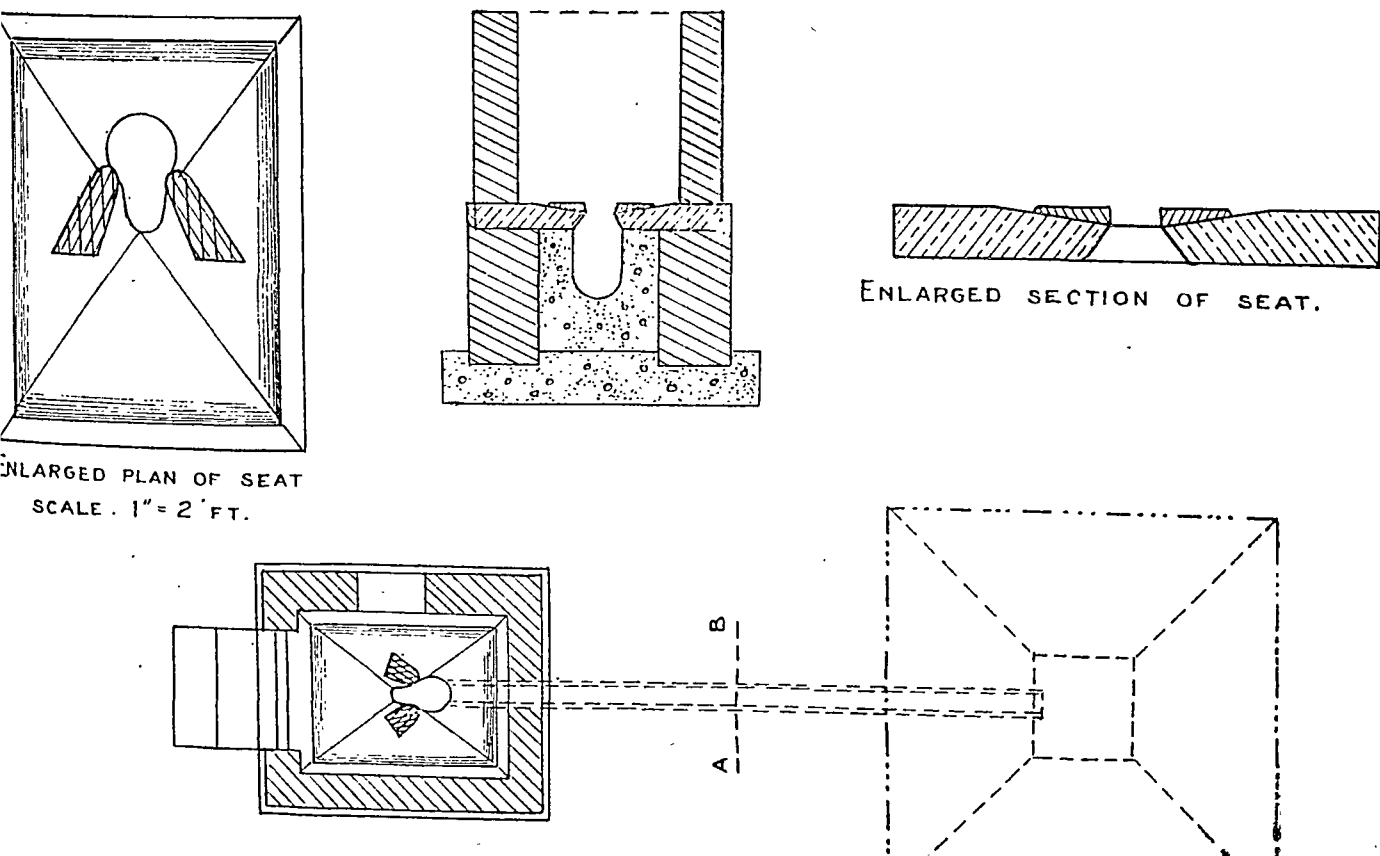
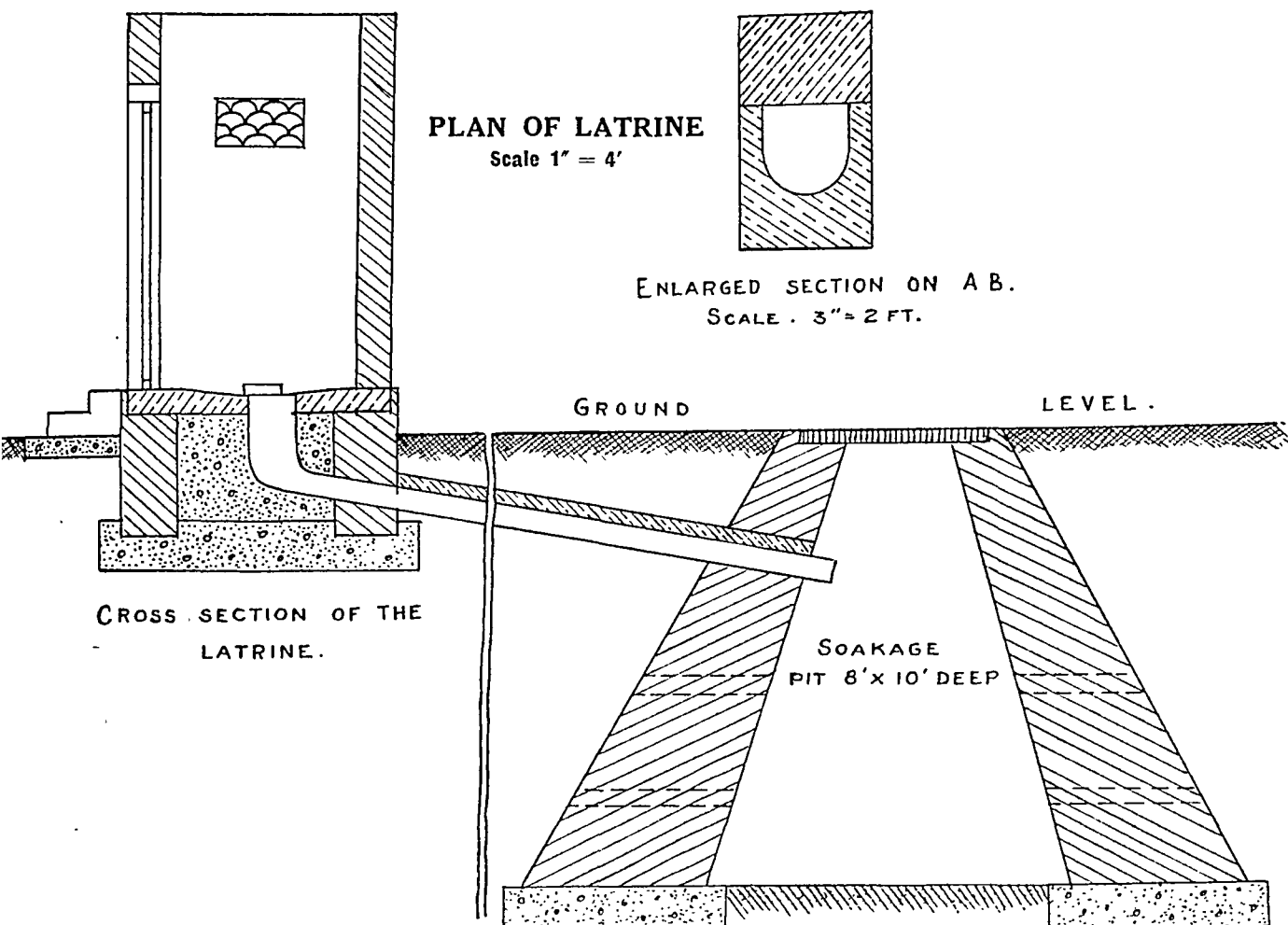
proprietary brands that are now obtainable. We have explained above that we consider the beneficial effects of an autovaccine of *Bacterium pseudo-carolinus* are probably of the nature of non-specific protein therapy, and this is borne out by one or two cases recently treated with T.A.B. vaccine with favourable results.

As in all forms of dermatitis general examination of the patient for evidence of septic foci is of the greatest importance. If found the removal of such a focus has great influence on the eventual cure. Regarding the use of autovaccines from a septic focus the only ones we have found to be of much benefit are those concerned with hæmolytic streptococci, such as one finds sometimes in a root abscess in a tooth.

are common characteristics at this stage, the addition of 2 to 4 drachms of olive oil to the ounce of calamine lotion is a great help in keeping the skin soft and pliable. At this time a daily tepid bath containing bran does a great deal to allay the irritation which is such a prominent feature. Sedatives such as 10 to 15 grains of potassium bromide three times a day are often useful in deadening the most acute sense of irritability and may be advantageously combined with magnesium sulphate in drachm doses.

When the acute and sub-acute stages have been passed a change may be made to a mild paste containing equal parts of zinc oxide,

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THE DESCRIPTION OF AN OLD TYPE OF PRIVY

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THE outline of a type of privy which is used in some parts of the west coast of the Madras Presidency is described in this article to give it wider publicity so as to enable its wider adoption wherever conditions favour it. The writer is not aware of its existence elsewhere and believes that such a restricted prevalence probably is due to a lack of knowledge of its existence. It is sketched and described in its present form. With some ingenuity and knowledge of the elements of engineering, alterations

(Continued from previous page)

starch, lanolin and liquid or soft paraffin. In a few instances persons sensitive to lanolin may be encountered when soft paraffin should be substituted for it.

If there is considerable thickening of the skin, which does not appear to be resolving, its disappearance may be hastened by the application of Lassar's paste. If the chronic patches still persist after this treatment a few x-ray exposures are often of great value.

There are many other drugs especially in the acute stage which can be tried if the above treatment is not well borne, amongst these some of the best are ichthyol, lotio plumbi subacetatis and one of the milder tar preparations. There is not time to enter into the use of all these in detail, but the essential in treatment of the acute stages is to alter the treatment the moment it is found unsuitable, as persistence with any drug (even zinc oxide) if in the least irritating will almost certainly mean an aggravation of the condition.

Summary

A common form of dermatitis has been described which we propose to name 'pityriasis rubra benigna' because it appears to us to represent a definite syndrome which is not clearly differentiated in modern books on dermatology, from other forms of dermatitis.

Inquiry into the ætiology indicates that at least 23 per cent are definitely allergic in origin. In the remaining 77 per cent no factors were found regularly present so it is probable that more than one cause exists.

The hottest months of the year appear to have a definite influence on the incidence of the disease.

An outline of treatment is given.

We wish to acknowledge with thanks the help of Professors M. N. De of the Department of Pathology, Medical College, Calcutta, for his report on the histology of the disease, which is incorporated in the paper, and to Dr. J. P. Bose, Diabetes Research Worker, Calcutta School of Tropical Medicine, for doing the adrenal function tests and the blood-sugar estimations.

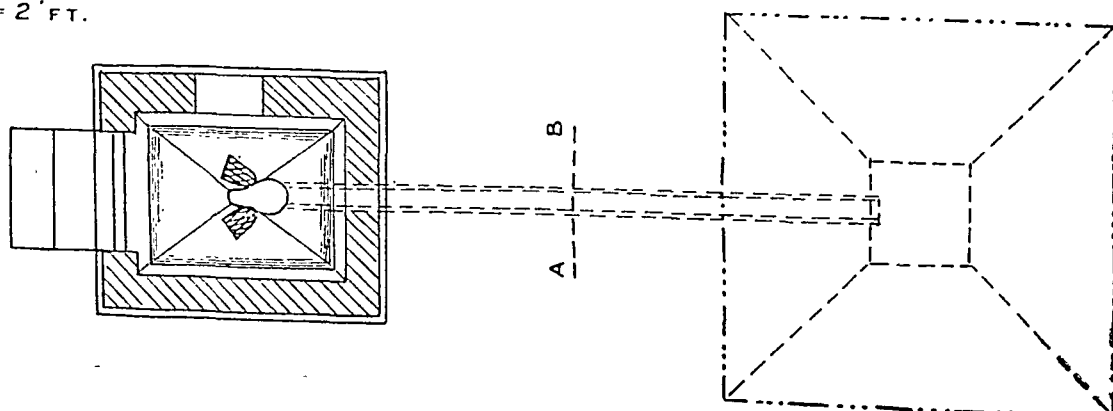
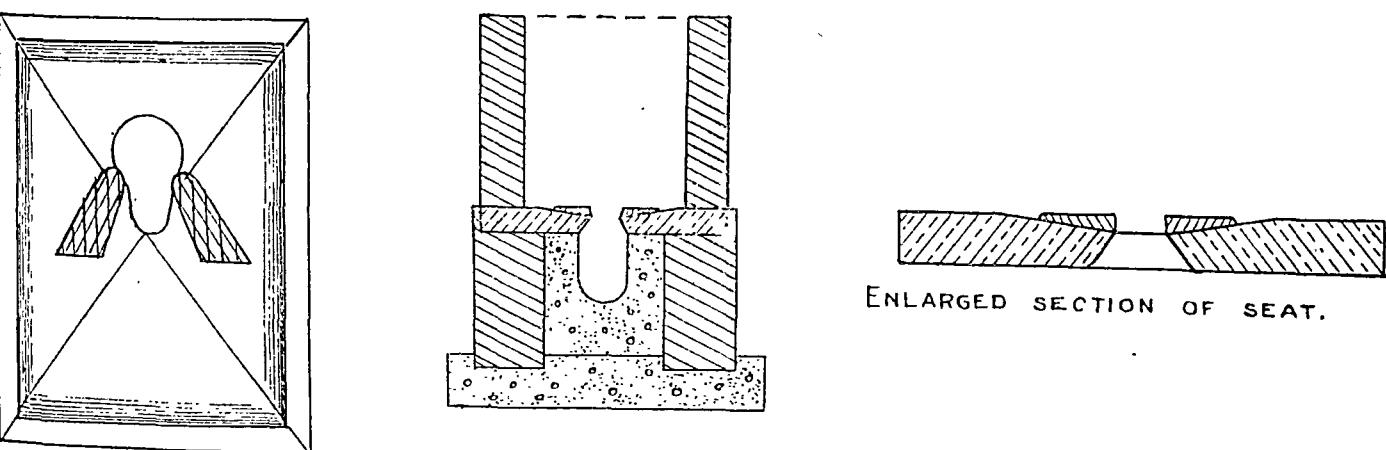
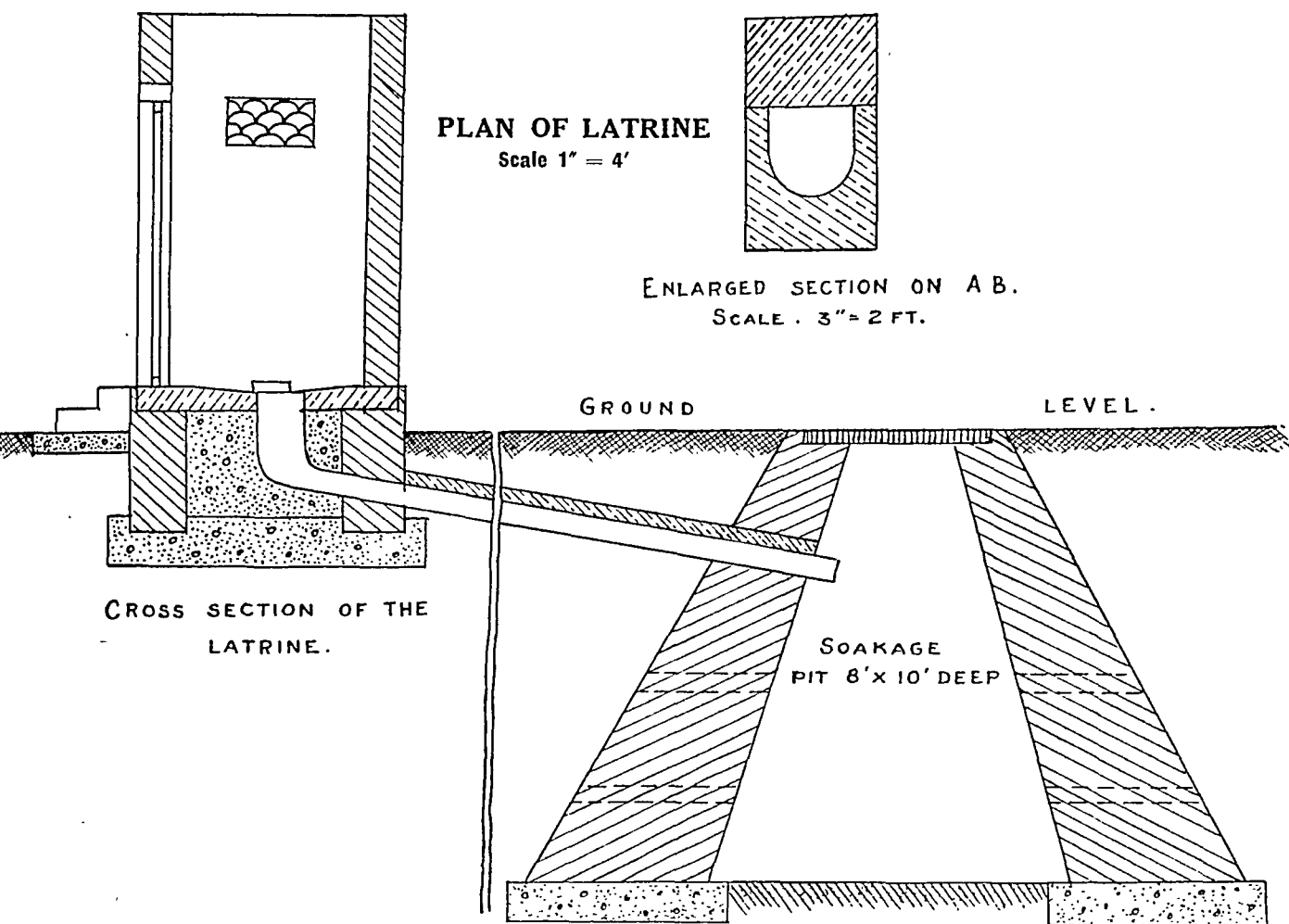
and improvements to suit local conditions can no doubt be effected without enhancing the expenditure.

It is primarily based on the same principles as those of the bore-hole latrine advocated chiefly by the Rockefeller workers for the rural areas in the tropics although the existence of the former antedates the introduction of the latter into India, at least by several decades. The former is remarkably free from smell and flies do not breed in it so that it can be installed right in the house thus enhancing its convenience. Also, with reasonable attention it can be kept clean. Disinfectants and the services of sweepers are not needed and it does not require interference for a long time. Save for a few large towns the source of water supply in the west coast is the well or the tank both in the towns as well as in the rural areas.

A squatting platform with the receiving hole, an impervious conducting channel in continuation of the latter opening into a soakage pit a few feet away from the squatting platform form the skeleton of the privy. Where the first part is not inside the house it is protected against sun and rain by a shed of varying structure, which also ensures privacy.

The squatting plate rests on a platform of masonry work about one and a half feet high and its top surface is flush with the floor of the room. It is made from a granite slab about two feet square and six inches thick. Leaving about an inch of margin on all the sides the surface is hollowed sloping towards the central hole which is surmounted on either side by the footrest. The hole is drilled nearer to the posterior edge and is 9 inches by 6 inches. The raised edge with the general incline towards the centre enables the complete draining of the ablution water into the hole and prevents its splashing on to the floor. Cement work has of late replaced the granite slab where the latter is difficult to acquire. A squatting plate of reinforced concrete fitted with a receptacle and water-trap as in the Hindustan type of water-closet may replace the granite slab. No foul gases escape from the hole in the existing system and even if any trace of them were to escape the water-seal will effectively shut them down and the additional amount of water needed would not be more than an extra pint. But this is a costly innovation and is not indispensable.

The next part, *i.e.*, the impervious channel, is also formed of two pieces of granite each 6 feet by 6 inches by 4 inches. A half-channel is cut in the centre along the whole length of one of these and the other one is placed lengthwise on the top, thus forming a well-protected drain. The opposing surfaces are carefully fitted and cemented at the edges. The half-channel opens out at the squatting end into a wider trough roughly equal to the sectional area of the hole. The channel arrangement is fitted on to the under surface of the squatting platform so that



the bottom of the funnel is formed by the widened out channel portion of the lower block and the covering piece or the upper block of granite is necessarily shorter than the lower one, by the length of the hole. The drain so formed slopes towards the pit with a good gradient and is below the surface of the earth.

The pit is dug in the earth and at a distance of about 6 to 8 feet from the squatting platform and its walls are constructed of laterite and mortar. The floor of this pit is not closed but is formed of the natural loose earth. The wall is sometimes plastered, sometimes not. An ordinary cistern has the following measurements. About 6 feet square at the bottom, it is narrowed down through a height of 8 feet into 1½ feet square at the top where it is closed by two equal pieces of laterite cemented together. The surface of this covering piece is 2 or 3 inches below the ground level. Sometimes two squatting arrangements are connected with the pit by separate drains thus providing greater convenience. As an improvement the covering piece of the pit may be made of concrete with a central hole for a narrow ventilating pipe 8 to 10 feet long supported by bars fixed to the side walls of the cistern. The soakage pit may also be converted into a septic tank by making its floor also impervious by laterite and cement and providing at suitable heights on the walls overflow exit holes. But again these are costly innovations and not imperative where cost is an important consideration. In some instances these soakage pits have been found to be located within the minimum safe distance of 50 feet from the well, but the general level of health of the persons using such wells for drinking purposes has not been observed to suffer for that. But it is no doubt safer and usually possible to construct the pit beyond this 50 feet distance.

A latrine of the above description used by a family of 8 to 10 members does not ordinarily call for interference for about 15 to 20 years or even longer. The pit is opened when necessary by removing the cover and if the privy has been working satisfactorily the almost dry powdery excreta is removed and suitably trenched, the pit cleaned and repaired if necessary and again closed.

The cost of constructing a privy of this pattern is about fifty rupees. The size of the soakage pit can be increased without appreciably adding to the cost thus enabling a larger number of people to use it without reducing the life of the latrine. Being free from smell it can be installed right in the house, thus making it serviceable for night use also. The disposal of night-soil in many towns in South India is deplorably inadequate and inefficient and in some places the defiling of roads and open spaces by promiscuous defæcation is so common that a solution of the problem of efficient disposal of night-soil still remains as pressing as ever.

A VILLAGE MOSQUITO-TRAP

By RAMKRISHNA N. GORE, L.M. & S. (Bom. Univ.)
Khar, Bombay

CONDITIONS necessary for a village mosquito-trap :

- (1) It must catch mosquitoes in numbers.
- (2) The mosquitoes caught should be easily destroyed.
- (3) It should be workable all the year round.
- (4) The materials must be easily obtainable in villages.
- (5) It must be cheap.

After four years of work with various devices a trap with the above qualities has been evolved.

The trap consists of an earthen pot (figure 1) commonly used for storing drinking water in villages and four pieces of woollen fabric 7 inches by 5 inches from a blanket of the type used by villagers. Each piece is tied at the centre of one end by a short string, the other end of the string being tied to a stone (figure 1) so as to counterbalance the weight of the piece of cloth. It is better to hem the sides of the four cloths. The cloths are so arranged as to form a cylinder in the body of the pot and project from the mouth. The cylinder remains about 4 inches above the bottom to allow the mosquitoes easy access to the darker places in the pot. The strings with stones attached hang outside the pot and hold the cloths in position (figure 2).

The trap is kept at night in a corner which has been previously ascertained to be a resting place of mosquitoes. This is determined by disturbing them from different places and observing for a day or two. One trap is kept in each room. The following morning situations other than those where the trap is placed are disturbed twice between 7 and 8-30 a.m. This is important since it helps in gathering more mosquitoes in the trap. By 10 a.m. the mosquitoes are at rest.

A piece of cloth is put over the mouth of the pot and one by one the four woollen cloths are pulled out after a little shaking with the help of the string, and keeping the palm of one hand over the cloth covering the mouth.

A flat metal or earthen dish, just the size of the mouth of the pot is held over the pot and the cloth gently withdrawn. The same cloth is again put over the closed mouth and tied at the neck by a piece of string. The mosquitoes are thus caught securely in the pot.

In India we get sunshine for more than eight months in a year. During these days the pot is kept inverted in the sun for one hour and the mosquitoes are killed by heat and fall on the dish. The pot still inverted is then brought into the house and placed on the floor. The knot is loosened, the string removed and the cloth spread flat on the floor. The pot is raised and shaken a little to bring out any dead mosquitoes that may be sticking inside. Finally

the mosquitoes are removed on a piece of paper and burnt.

During the monsoon the mosquitoes are killed by fumigation or asphyxiated to such an extent that they can be easily removed on a piece of paper and crushed. This is effected by burning cow-dung cake. To facilitate the process of fumigation cowdung 'cigars' 4 inches in length and $\frac{5}{8}$ inch in diameter are prepared during the summer. A hole $\frac{3}{4}$ inch in diameter is made in the side of the pot. When not required the hole is closed by a cloth plug. The mosquitoes are caught as usual. The 'cigar' is well lighted,

practical solution of the problem of the prevention of infection among rural population in such hyperendemic area....by the destruction of mosquitoes....'. I venture to hope the trap described will to some extent fulfil this purpose.

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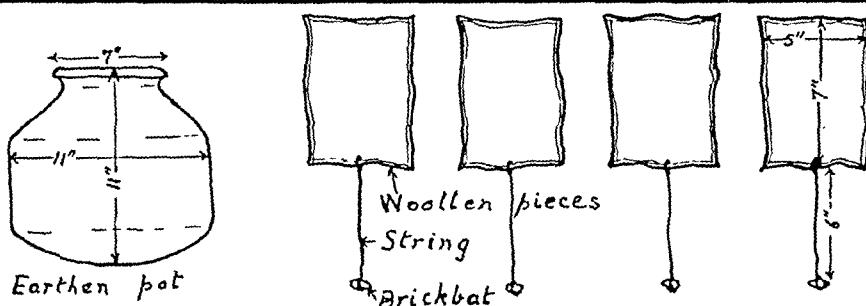
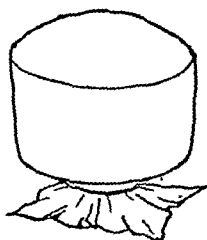


Fig 2



Section of pot showing position of woollen pieces

Fig. 3



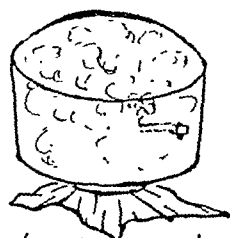
Position of pot in the sun

← KILLING BY SUN HEAT

OR

KILLING BY FUMIGATION →

Fig. 4



Lighted cigar introduced through the hole

the plug removed, and the 'cigar' introduced. The escape of smoke through the hole can be minimized by wrapping a piece of cloth at the other end of the 'cigar'. After 30 minutes the mosquitoes are asphyxiated and can be removed on a paper and crushed; or if left for one hour the mosquitoes will be found to be dead. The dish serves to catch the dead mosquitoes as well as the falling cinders.

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The disadvantage in using the 'cigar' to kill the mosquitoes would be the slight smell that it would leave behind; this might act as a repellant. Killing by the heat of the sun is obviously the ideal method and it should be possible in most places in India to use this method more than the eight months that the author mentions.—Editor, I. M. G.]

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A VILLAGE MOSQUITO-TRAP : GORE

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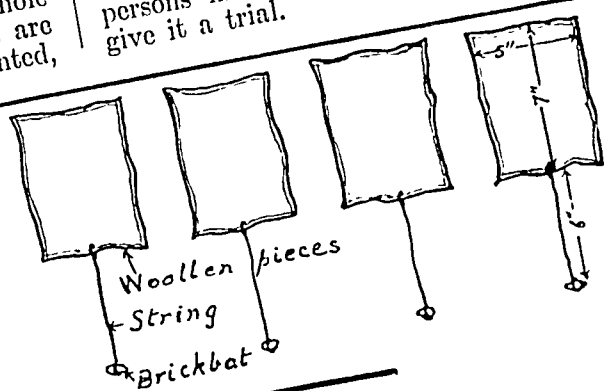
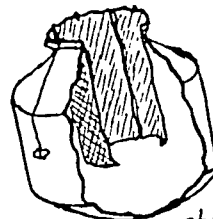
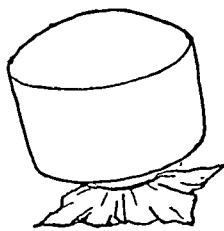


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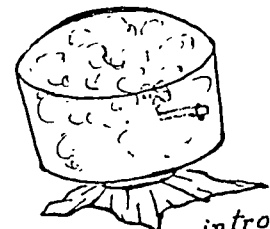
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A Mirror of Hospital Practice

AN UNUSUAL CASE OF SUICIDAL STABBING*

By R. G. VANCHESWARA IYER, L.M.P.

Sub-Assistant Surgeon, Civil Hospital, Thongwa

THE following case of suicidal stabbing is of a sufficiently unusual character to warrant its publication.

The dead body of a Burman, male, age about 50, was brought to the Civil Hospital, Thongwa, on 9th August, 1935, for post-mortem examination.

History of the case.—The man, a bachelor, was living with his sister. He was apparently in normal health. Early on the morning of Friday, 9th August, 1935, he was heard shouting from the paddy field. His sister's son ran to the field and found his uncle with stab wounds in his abdomen. He was said to have told his nephew that he stabbed himself in a fit of despondency. The boy ran to the village headman who collected a few villagers and went to the paddy field where they found the man with his entrails out of his abdomen. He was still talking, and told the headman and the villagers that he had stabbed himself, pulled out his entrails and torn them from their abdominal attachments. The villagers gathered his entrails in a bundle and took him from the paddy field to the motor road with a view to his ultimate transport to Thongwa for treatment at the hospital. However, he is said to have expired on reaching the road.

Post-mortem findings.—On post-mortem examination two stab wounds were found on the front of the abdomen in the middle line, one at the pit of the stomach 2 inches long by $\frac{1}{4}$ of an inch broad and penetrating into the peritoneal cavity, and the other 3 inches below the first injury 3 inches long by 2 inches broad with protrusion of the omentum and mesentery. The stomach, all the small intestines and part of the large intestines consisting of the ascending and transverse colon were found torn from their abdominal attachments and were produced bundled up in a piece of cloth. There was a stab wound in the left lobe of the liver 1 inch long and the peritoneal cavity contained about 2 pints of fluid blood. I ascribed the cause of death to shock and hæmorrhage from the stab wounds in the abdomen.

It seemed conceivable that a person might stab himself twice in the abdomen but that he could go on and tear out his abdominal contents and still have sufficient vitality to tell his friends of it seemed impossible. The sight of the disembowelled body brought to my mind the incident narrated in the Indian Epic Mahabharata where King Bhima is said to have vented his wrath on his cousin Dhusshasana for the offence of violating his wife Draupathi, by tearing open his body and removing the entrails and wearing them round his own neck and

executing heroic dances on the field of battle. I therefore considered it possible that it was a case of murder and suggested this to the police.

I expressed my disbelief of the history furnished to the township magistrate, Thongwa, who held an inquest at part of which I was present. All the witnesses testified to having heard the man say he had stabbed himself and torn out his entrails, therefore the verdict of suicide had to be accepted. This case presents strange features which will be of interest to all who have to deal with medico-legal cases.

SPIRILLUM FEVER CAUSED BY A MONKEY BITE

By M. A. KRISHNA IYER

Resident Medical Officer, Headquarters Hospital, Chittoor

DURING the last week of May 1935, a monkey ran 'amok' and bit 22 persons. Most of them underwent anti-rabic treatment in this hospital. The monkey was caught and sent to the veterinary hospital for observation. It was kept under observation for about 15 days and afterwards destroyed. Though rats, bandicoots and other carnivorous ferrets are known to transmit the spirillum, a monkey has not been previously mentioned as a vector.

The following two cases illustrate the possibility of producing 'rat-bite fever' by a monkey bite. It was not possible to inject guinea-pigs with the blood of the patients and isolate the spirillum. Many examinations of thick and thin films of the blood from the patients, stained by Leishman's method, proved negative. The diagnosis was made purely on clinical grounds. Both cases exhibited the periodical onset of fever with apyrexial periods, the flaring up of the initial wounds with their red, eroded and swollen appearance, involvement of the regional lymphatic glands, the erythematous or reddish-brownish blotchy eruptions on the skin in different parts of the body and the degree of apparent well-being during the apyrexial period.

Case 1.—A girl, aged about 13 years, was bitten by the monkey on 26th May, 1935. The next day the wounds on the right side of the scalp above the ear were cleaned and cauterized. She was given anti-rabic treatment. Shortly after completion of the anti-rabic treatment, she got fever with severe rigor. The next day the site of the original lesion was red and inflamed. The lymph glands behind the ear and under the jaw on the right side were enlarged and tender. Suspecting some secondary infection of the wound scar, she was given an injection of anti-streptococcus polyvalent serum. The same day the temperature shot up to 105°F. in the evening. The condition lasted three or four days and she recovered completely. After five days the fever again started with all the above-mentioned symptoms. In addition erythematous patches of varying sizes were noticed in different parts of the body. The next day, 12th July, she was admitted to the hospital as an inpatient. The condition was very like rat-bite fever clinically; though hæmatological examination was negative, she was given an injection of neosalvarsan subcutaneously. Two days later the temperature dropped to normal and did not rise again.

* Rearranged by Editor.

After an interval of four days she was given another injection. The skin rash had completely disappeared by then. After one more injection of the same drug, she was discharged completely cured on 22nd July and since then she has remained in excellent health.

Case 2.—A widow, aged about 30, was bitten by the same monkey on 1st June and she was given a complete course of anti-rabic treatment. The woman also developed fever and other signs and symptoms similar to the first case, but of a more severe type. She was admitted to the hospital as an inpatient on 22nd July and was discharged cured on 3rd August after similar treatment to that given to case 1.

Points worthy of note in the above-mentioned cases are:—

(1) Monkey bite produced a clinical condition exactly like rat-bite fever.

(2) It was unfortunately not possible to isolate the causative organism.

(3) Drugs of the neosalvarsan group completely cured the condition.

My thanks are due to Dr. D. Krishnayya, my District Medical Officer, who has permitted me to publish this note.

TWO CASES OF PANCREATIC DEFICIENCY

By Y. SURYANARAYANA ROW, L.M.P., L.T.M.

Assistant to First Physician, Government Rayapuram Hospital, and Assistant Lecturer in Medicine, Stanley Medical School, Madras

Case 1.—N. G. S., male, aged about 51 years, caste, Parsee, merchant by occupation, was admitted into the Government Rayapuram Hospital, Madras, on 29th January, 1935, with a history of having large loose motions, 3 to 6 a day, for the previous one and a half months. There was also some discomfort and pain in the abdomen, which was neither regular nor had any relation to food.

Examination.—The patient was a fairly-nourished individual. There was no anæmia. Teeth were dirty and tartar was present. Tongue was slightly coated in the middle. The edges were red and painful; the patient could not take hot and pungent things. Spleen and liver were not enlarged. Abdomen was a little flabby. The patient was having loose motions 3 to 6 a day. They were very bulky, though the amount of food taken was considerably less. Colour of the stools was yellowish, they were also frothy, and emitted an offensive smell. No blood or mucus was present. Microscopical examination of stools did not show any ova, amœbæ or cysts. Biochemical examination of faeces gave the following results: Total fat, 38.4 per cent; neutral fat, 14.46 per cent; fatty acids, 10.74 per cent.

The gastric fractional test meal showed slight hypochlorhydria as shown in the following report:

	Total acidity c.c. N/10 NaOH%	Free HCl c.c. N/10 NaOH%
Before test, meal.	28	22
½ hour after ..	20	14
1 " " ..	32	27
1½ " " ..	47	39
2 " " ..	39	33
1½ hours " ..	18	14
1½ " " ..	42	36
1½ " " ..	34	36
2 " " ..	16	Nil

Cardio-vascular system.—Heart sounds were normal. Apex beat could not be seen or felt due to the thick muscular wall of the chest. Blood smear showed a few megaloblasts and no normoblasts. Nothing was found abnormal in the respiratory and urinary systems.

Treatment.—The fat analysis of the faeces was made a little late in the course of the stay of the patient in the hospital. Till then, he was treated as a case of sprue. He was put on large quantities of milk with no solid food, the milk being citrated; by mouth he was given calcium and parathyroid tablets. The condition of the teeth was attended to by a dentist. Six hypodermic injections of emeline $\frac{1}{2}$ grain a day were also given. He was put on an acid mixture containing iron and hydrochloric acid. The patient did not show much improvement except that the number of motions was decreased to 2 or 3 a day. But the bulky and frothy character of the stools remained. Then it was thought that the result of the fat analysis of the faeces would throw light on the disease. The result showed that the fatty acids were less than the neutral fat, which is quite the reverse in normal individuals. It therefore showed deficiency in the pancreatic secretion, resulting in the excess of unsplit fat. Therefore revising our diagnosis in the light of the above biochemical report from one of sprue to one of pancreatic deficiency, the patient was at once put on 'Festal' tablets of Bayer, one thrice daily. Festal is a preparation of pancreas having a standardized content of pancreas lipase, amylase, protease, and hæmicellulase. Besides the patient was also given Decholin both intravenously and by mouth. After the administration of Festal tablets, the patient made a speedy recovery in about a fortnight; and he was discharged much relieved on 20th March with instructions to continue the treatment at home. I saw the patient in the month of August 1935, when he informed me that he was completely all right and that he was taking the Festal tablets only occasionally and not regularly.

Case 2.—G. K., aged 40, male, caste, Hindu. He was working in the Federated Malay States for the last 8 years previous to the present illness as an engineering assistant. From the beginning of January 1934, the individual was having loose watery motions 6 to 8 a day which gradually increased to about a dozen a day. He had to give up work on account of this disability and landed at Madras on 22nd November, 1934. The motions were white, frothy, and bulky. They were also foul-smelling and sour. The patient complained of burning sensation after every motion. He had no griping, nor did he pass any blood or mucus in his motions. The diarrhoea had no relation to food. Appetite was fairly good. He had lost all sensation of taste of food. Tongue was sore and very painful if he took anything hot or pungent. There was no distension of stomach nor any acid eructations. The patient was reduced in weight from 140 to 86 lbs. The condition of the mouth used to become worse every time the diarrhoea increased. In the latter stages of the disease, the patient was having œdema of the feet which became worse if there was any amelioration in his diarrhoea.

Examination.—The patient was a poorly-nourished and emaciated individual. The tongue was ulcerated at the edges and it was smooth and glossy having been denuded of epithelium. Appetite was moderate. There was no vomiting. He had 6 to 12 loose, frothy, very bulky, foul-smelling and white-coloured motions every day. There was neither blood nor mucus in the motions. Teeth were dirty. There were no amœbæ, cysts or ova of any kind in the stools. The fractional test meal showed achlorhydria as is seen from the following report:

	Total acidity	Free HCl
Before test meal.	3	Nil
½ hour after ..	5	..
1 " " ..	5	..
1½ " " ..	7	..
2 " " ..	10	..

Mucus and starch were present in all.

Fat analysis of the faeces showed total fat, 58.24 per cent, free fatty acids 11.52 per cent, neutral fat 22 per cent.

Heart was normal. Red blood corpuscles were 2,250,000 per c.mm. The hæmoglobin was 40 per cent. There were no signs of pernicious anæmia. Biochemical examination of blood for calcium showed 9 mg. per cent.

Urine. Specific gravity was 1016, reaction acid, no albumin, or sugar. Biochemical examination showed diastase content $d_{36}^{36} = 50$, showing thereby a high index, the normal being 6 to 30 units.

Respiratory and nervous systems were normal.

Treatment.—The patient was given three courses of hookworm treatment at intervals of a week each. Since the fat analysis of the fæces was done early in this case, which gave us the clue as to the cause of the disease, viz, pancreatic deficiency, the patient was put on Festal tablets (Bayer) one thrice daily. Besides he was also given injections of Campolon 5 c.cm. twice a week. He was put on fat-free diet as far as possible (skimmed milk, orange juice, etc.). Iron and arsenic mixture was also given by the mouth. The patient put on 12 lbs. weight within a month after admission. The number of motions decreased to one a day. Even that was well formed, of normal colour bulk and consistency. He was discharged much better after nearly one and a half months' treatment. But he was advised to continue Festal tablets for some time more.

Comment.—It is often stated that sprue is not common in India, and, even if it occurs, it is rare among Indians. From the beginning of 1930, till the end of 1934, 21 cases of sprue were admitted in the Government Rayapuram Hospital, Madras. All of these except two were Indians, one was a European and the other an Anglo-Indian. In all of these, typical signs of sprue were present, viz, sore tongue, characteristic diarrhoea, and a certain amount of anæmia together with wasting and debility. In all these cases the anæmia was of the hypochromic type. All the above symptoms which occur in sprue, also occurred in the above two cases detailed by me. Therefore, clinically, it is very difficult to differentiate between cases of sprue and those of pancreatic deficiency. The diagnosis of all the above cases of sprue except four was not based on the results of the fat analysis of fæces. The fat analysis of these four cases showed the percentage of free fatty acids to be high and the neutral fat low, thereby showing that the pancreatic secretion was doing its work on the contents of the intestine, but these split fats were not absorbed by the mucous membrane of the small intestine. Therefore the differential diagnosis between sprue and pancreatic deficiency can only be made by the fat analysis of the fæces and also by the estimation of the diastase content of the urine, which is always high in the latter disease*. In a normal stool, fat is almost entirely present in the form of amorphous masses of soap and in the form of fatty acids. Neutral fat is about half the quantity of fatty acids. But in pancreatic disease, the neutral fat is always in large quantities as is seen in the above two cases. Besides, in a normal individual, all the fat in the fæces is found split except about 10 per cent. Whereas

in pancreatic disease most of the fat present in the fæces is unsplit and the amount split is small. But in cases of sprue, since there is no interference with the secretion of the pancreatic juice, the neutral fat in the fæces will be less and the split fat is more in the proportion of 1 to 4—6, and these split fats are not absorbed by the atrophic intestinal epithelium.

Another diagnostic point in some cases of pancreatic deficiency is the presence of high diastase index. In a normal individual, the index is from 6 to 30 units. But in pancreatic disease, it is much more as is seen in the second case referred to, though it goes much higher than that, up to 200 or 300 units even. I would like to mention the case of a medical student who has been suffering from frequent loose bulky and sometimes frothy motions for the last three years. He was for some time treated for chronic amœbiasis and was given two courses of emetine injections, each of nine injections of $\frac{1}{2}$ grain a day. The treatment had very little effect. He was also treated for sprue for some time with little or no improvement. His motions were not analysed for fat at any time previously. When he came under us for treatment in the Government Rayapuram Hospital, Madras, my chief, Dr. P. Krishnaswamy, advised me to send the motions for fat analysis with the result that it showed excess of unsplit fat over split fat showing thereby that the pancreas was at fault. As soon as this patient was put on the same treatment as in the above two cases, he made a good and speedy recovery.

My thanks are due to Dr. P. Krishnaswamy, M.B., C.M., M.R.C.P., First Physician and Superintendent of Government Rayapuram Hospital, Madras, under whom all the above cases came for treatment, for going through these notes and for allowing them to be published.

A CASE OF PERSISTENT HICCUP

By V. Y. APTE, M.B., B.S., D.L.O. (Lond.)

Nayabazar, Lashkar, Gwalior

THE patient, aged 60, of good physique, was admitted into J. A. Hospital, Gwalior, on the 7th January, 1935. He was operated on for a strangulated hernia on the right side, 12 hours after the onset of strangulation. The hernia was a direct one and it was of 20 years' standing. The patient had been using a truss. The operation lasted for about one and a half hours. At the operation the strangulated portion of the bowel was found viable and so it was returned into the abdomen. Occasional hiccup had occurred with vomiting before the operation. After the operation no hiccup was noticed till next morning. During the first 24 hours the patient vomited three times. There was no distension of the abdomen nor any other symptoms connected with the operation. Occasional hiccup occurred throughout the day. Eucadol injection, given for pain, was again repeated for hiccup, which relieved the patient temporarily. A second injection of eucadol failed to arrest the hiccup. Tincture of iodine in drop doses orally, adrenalin solution by mouth, powders of sodium bicarbonate, mustard plaster over the abdomen, soda water, all these failed

* This is particularly noticeable in acute conditions but not necessarily in the chronic affections of the pancreas.—EDITOR, I. M. G.]

to stop the hiccup. Carminative mixture with capsicum did not give any relief. Adrenalin injection gave relief for half an hour only. Morphia injection at night gave the patient sleep, but loud and violent hiccup persisted throughout the night. Amyl nitrite capsules were tried but were ineffective. After a turpentine enema the hiccup was arrested for 20 minutes only. Bromides and luminal also failed to arrest it. On the third day the stomach was washed out with large quantities of alkaline solution but the hiccup which stopped temporarily started again after 20 minutes. Two oral tablets, instead of producing sleep, only excited the patient to talk incoherently. After another stomach-wash a mixture of cocaine, morphia, and bismuth powders in small doses repeated frequently did not do any good. The patient got very constipated but the hiccup was not arrested.

By the fifth morning the patient was very distressed. He had pain in the chest and dozed occasionally wakened by the hiccup. After luminal tablets, the patient had an hour's sleep. Then he continued to be drowsy with the hiccup persisting. Benzyle alcohol 10 minims in water in repeated doses had no effect. Small doses of calomel were tried to no effect. On the sixth morning an atropine injection was given but the hiccup continued. Oil of cloves by mouth in drop doses, glycerine plugs in the nose, cocaine spray in the nose were all equally ineffective. High frequency current to the neck on the left side along the sternomastoid muscle was applied but to no effect. In the evening carbon dioxide gas inhalations were tried for one hour. The patient slept without hiccup for 20 minutes only. By this time he was very much exhausted and he would fall asleep in spite of the hiccup.

The hiccup prevented the patient from taking any nourishment. It had become very persistent, loud, violent and it occurred from 15 to 20 times per minute. This interfered with respiration, so much that it could not be properly counted. On the sixth day the patient, himself a doctor, refused to have any allopathic treatment as no known remedy was left to be tried. Dr. Marchant asked the patient to give a trial to homœopathic or ayurvedic remedies. A number of homœopathic drugs and ayurvedic remedies were used which were all equally ineffective. On the seventh morning (the 13th January, 1935), gastric lavage was again tried but gave only temporary relief. Carbon dioxide inhalations (arranged by two cylinders of oxygen and carbon dioxide gas regulated in proportion) were tried but failed to give even slight relief. In the afternoon the patient submitted to the operation of phrenicotomy. Under local anæsthesia, after due preliminary preparation of the neck on the left side, through a small wound by careful and accurate dissection, Dr. Marchant exposed the phrenic nerve and injected alcohol into it. The hiccup did not stop, so the nerve was crushed with artery force and cut. The nerve ends were put in opposition. It did not stop the hiccup but the spasm was decreased in force. The wound was closed and dressed. Next morning the patient felt more refreshed as the spasm of the hiccup did not prevent him from sleeping. The hiccup persisted but with less force and allowed the patient to take sufficient nourishment. Mesmeric passes were tried on two days and they proved effective, as the intervals between the hiccups got longer and ultimately stopped.

On the 13th morning there was slight serous discharge from the wound but no sepsis. There was no reason to attribute the hiccup to the strangulation operation or to the chloroform. The temperature never rose even to 100°F. The pulse which was 88 from the start rose to 110 per minute on the 10th day, after the operation. Hiccup does occur as a post-operative complication of strangulated hernia. But in such cases there are usually other symptoms present, such as tympanites, vomiting, constipation, temperature, or other symptoms pointing to a toxic origin of the hiccup. In this case apart from the hiccup the patient's convalescence was uninterrupted by any other symptom.

In order to satisfy the patient, at this stage the so-called chromeopathic treatment, *viz*, water from the blue bottle, was administered. This remedy is reputed to be soothing in certain nervous disorders.

As to the treatment in this particular case none of the reputed drugs for the cure of the hiccup either in the allopathic pharmacopœia, the homœopathic repertory, or from ayurveda was left untried. Even the phrenicotomy operation, though it decreased the spasm of the hiccup by putting half of the diaphragm out of action, did not cure the condition. In Hamilton Bailey's *Emergency Surgery* phrenic avulsion is said to be the safest, surest, and complete cure for the hiccup. Mesmeric passes were effective after the operation but, whether they would have been so at the beginning, cannot be said.

After two months the patient was screened and it was found that the left side of the diaphragm moved equally well up and down as that of the right side. This showed that the phrenic nerve on the left side had been working normally.

I, as the son of the patient, owe a great debt of gratitude to Dr. Marchant for her keen interest, sympathetic treatment, operative skill, and for permission to report the case.

TRAUMATIC RUPTURE OF PANCREAS WITH FORMATION OF A CYST*

By M. A. SAMI

Assistant Surgeon, Rajanpur (D. G. Khan)

A WOMAN, aged 20 years, was carried to the hospital on a bed. She was lying on one side with her legs drawn up and any attempt to move her or to straighten her legs made her scream with pain; the pain was in the abdomen.

There was a tense, fixed swelling in the upper part of the abdomen in which there was no fluid thrill or pulsation. As far as could be made out a coil of intestine was lying across the upper part of the tumour.

Her temperature was 96°F. and her pulse good. She said that she feared to take any food or liquid as it caused a great increase in the pain which was present all the time, both in front and posteriorly about the level of the first lumbar spine. For the past three months she stated she had only been able to take small quantities of parched millet and even then she was frequently troubled with vomiting and pain but this had got much worse in the last few days. Her urine was normal.

History.—About six months ago she was lying on her back on the ground one evening, when a cow stepped on her epigastrium. She fainted at once and recovered the next morning.

There was hæmatemesis and pain in the epigastrium. The hæmorrhage soon stopped but the pain and vomiting continued. They were to some extent relieved by opiates. This condition persisted, gradually getting worse in spite of all attempts at treatment until she finally came to the hospital.

About three months after the accident she first noticed the swelling in the abdomen, and this had gradually increased in size.

Operation.—The woman was operated on immediately, under chloroform anæsthesia.

The abdomen was opened by a paramedian incision over the tumour and the stomach was found pushed upwards and to the left, the transverse colon ran across the lower part of the swelling and the omentum below the stomach was adherent to the tumour. This was found to be cystic in nature so it was first anchored to the incision in the abdominal wall, and then opened

and drained, when it was seen that it arose from the site of the pancreas.

Excoriation of the skin around the opening was troublesome for some days. This was lessened by restricting the diet to carbohydrates and also protecting the neighbourhood of the wound with vaseline. It was found that addition of fats and proteins to the diet increased the cutaneous irritation. Apart from the local effect of the fluid from the cyst, recovery was uninterrupted and she was discharged forty-eight days after admission to the hospital. During convalescence the woman put on a great deal of weight.

The history of the accident, site of the tumour and subsequent effect of the fluid of the cyst on the skin make it clear that this was a ruptured pancreas.

A DEPRESSED COMPOUND FRACTURE OF THE SKULL WITH INFECTION

By JAMIAT SINGH, M.B., B.S., F.C.M.S.

Civil Hospital, Samrala, Ludhiana District, Punjab

THE patient was admitted into the hospital on 25th July, 1934, with a contused wound on the head.

On examination an infected wound was seen on the right side of the forehead 1 inch above the right eyebrow; it measured $\frac{3}{4}$ inch long and extended down to the bone. The frontal bone was fractured and depressed and the patient deeply unconscious. There was marked ecchymosis of both the eyelids and the area round about the wound presented œdematous swelling.

Temperature on admission was 101°F.; pulse 70; pupils were dilated.

The patient had received the injury three days before and had been since then unconscious.

Operation.—On the next day an incision 4 inches long was made 3 inches above and 1 inch below the original wound. A depressed piece of bone about 1 inch by 1 inch was found just below the original wound with fractures running upward and downward from it. A portion of the healthy bone was trephined and removed and also the depressed separated piece of bone. A huge extradural blood clot was removed, the membranes were well washed with normal saline and the wound almost closed with stitches.

For two days the condition of the patient remained completely unaltered so it was thought a second fracture might be present.

The wound was opened again and a more extensive exploration downwards was done. There was another depressed fracture on the outer aspect of the supra-orbital margin. This fracture was treated like the first.

After this the patient began to show signs of recovery and he regained consciousness within twenty-four hours.

He was discharged from the hospital cured on 9th October, 1934.

AN ARROW HEAD IN THE MOUTH FOR THREE YEARS*

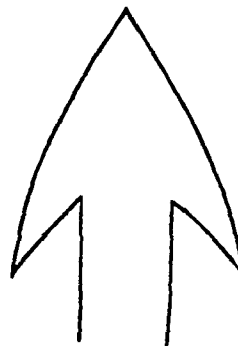
By S. KUNDU, M.B., A.M.S.

Assistant Surgeon, Civil Hospital, Mokokchung, Naga Hills

On the 3rd February, 1936, a Sema Naga, aged 29 years, came to the hospital for the removal of the iron head of an arrow from his mouth, which he said had been there for the last three years.

A black, pointed body could be seen embedded in the left side of the mouth in the anterior pillar of the fauces. The left side of the tongue was ulcerated from constant friction on the foreign body.

The history of the case.—About three years ago the man was concerned in a fight with a neighbouring village. An arrow hit him on the upper lip just below the left nasal orifice dividing it from above downwards. It knocked out the left upper lateral incisor tooth and injured the gum, broke the left lower lateral incisor at the root, cut through the left side of the base of the tongue and entered the tissues. The arrow was removed forcibly by the man himself, immediately after he was hit. The injuries to the lip, gum, tongue, and lateral wall of the mouth, healed up in course of time without any treatment. There was a scar on the lip like a surgically treated hare-lip, a gap in the upper gum with the absence of the upper and lower lateral incisors. For the first two years after the accident the man had no idea there was a foreign body but noticed a little swelling on the left side of the mouth without any pain or trouble whatsoever. About a year ago an abscess formed on the swelling, burst of itself and healed up naturally, leaving the sharp point of the foreign body



Actual size of the iron head of arrow removed from the mouth.

exposed. He then suspected the presence of the head of the arrow as a sharp pain was constantly felt in the tongue; this became very severe recently. The man tried himself to remove the foreign body and also sought the help of others but to no effect.

Operation.—The man was operated on and the iron head of an arrow with two angles on the sides was removed. A sketch is given to show the shape and size of the arrow head.

The remarkable points in this case are :—

- (1) No irritation was caused by the foreign body for the first two years and the man had no idea of its presence until the ulceration on the tongue became painful.
- (2) The man had no pain or difficulty during mastication of food.

A FŒTUS WITH ITS PLACENTA ADHERENT TO THE BRAIN

By P. N. SEN, L.M.P.

Resident Medical Officer, Tata's Main Hospital, Jamshedpur

On 28th December, 1935, at 10-30 a.m., female patient, aged about 22 years, w:

admitted into Tata's Main Hospital at Jamshedpur with labour pains (duration two days). She was over 8 months' pregnant and was getting strong pains at the time of admission. History of miscarriage about two years back in her fifth month of pregnancy. She had no other issue. She had had urethritis some years previously. She was fairly well nourished.

Heart normal, pulse 98 per minute and of fair tension. Temperature—97.6°F. Lungs—normal. Liver and spleen not enlarged.

Fœtal parts could not be palpated properly as the uterus was tonically contracted. Fœtal heart sounds not audible. Discoloured coils of intestines of the fœtus were found protruding through the vagina.



The patient was given chloroform. The coils of intestine were thoroughly cleaned and washed antiseptically. Internal examination revealed it to be a case of transverse presentation. A dead female child was delivered by podalic version and I noticed the following abnormalities:—

- (i) Abdominal wall not properly developed.
- (ii) Spleen and intestinal coils were exposed on the left side.
- (iii) Left eye absent, represented by an elevation.
- (iv) Parietal bones not properly developed.
- (v) Placenta adherent to the dura mater and a rudimentary cord connected it with abdomen.
- (vi) Hare lip with a cleft extending to the anterior fontanelle.

The patient had a slight temperature for the first four days but was otherwise quite well.

She was discharged on 6th January, 1936.

I thank Dr. J. M. Rakshit, Chief Medical Officer, for permitting me to send this for publication and also to our Medical Officer Dr. L. R. Khan, who was kind enough to help me with the photograph.

AN EXTENSIVE EMPYEMA

By B. L. CHOPRA, L.R.C.P., L.R.C.S., L.M., D.P.H.,
D.T.M. (Liverpool)

Divisional Medical Officer, N. W. Railway, Delhi

A GATEMAN, 39 years of age, was admitted into the Ghaziabad railway hospital on 19th March, 1935, suffering from lobar pneumonia of both lungs. After receiving treatment there for about three weeks he was transferred to Delhi railway hospital because, although his lung condition showed a slight improvement, a hectic temperature with rapid respiration persisted.

On admission here on 12th April, the right side of the chest was found immobile on respiration and the intercostal spaces appeared to be slightly bulging. It was dull on percussion and no vocal fremitus could be elicited. A certain amount of fever and dyspnoea were present. Empyema of the right side was suspected and this was confirmed by puncture with an exploring syringe under local anaesthesia.

Aspiration of the pus was undertaken and about 12 ounces were drawn off, giving the patient relief. After three days, however, dyspnoea again became troublesome and it looked as if the empyema was reforming with great rapidity. It was therefore decided to open the pleural cavity. This was done under local anaesthesia. About 2 inches of the 8th rib was excised subperiosteally. Large fibrinous masses were encountered and removed and drainage was established. Gentle irrigation of the pleural cavity with warm eusol was started. After about 10 days' treatment the discharging sinus looked as if it was going to persist, so a counter opening in the form of a stab wound was made a little lower down and the original wound closed. The man made a good recovery after this procedure and was discharged cured on 4th June, 1935.

The operative treatment in this case was supplemented by breathing exercises where the patient blew water from one Wolfe's bottle into another.

My thanks are due to the Chief Medical and Health Officer, N. W. Railway, Lahore, for his kind permission to publish this case.

THREE CASES OF ADHERENT RETROCÆCAL APPENDIX

By B. L. CHOPRA, L.R.C.P., L.R.C.S., L.M., D.P.H.,
D.T.M. (Liverpool)

Divisional Medical Officer, N. W. Railway, Delhi

THE following cases are very characteristic of what is frequently seen but the first case was rather unusual as on account of the nature of the adhesions the appendix could not be removed. All the three cases of appendicitis occurred amongst the lower-paid classes of railway employees. This fact is also contrary to the general belief prevailing amongst the laity in India that appendicitis is a disease of the rich.

Case 1.—A fireman was admitted in Kalka railway hospital with all the clinical symptoms of appendicitis. After the attack subsided, he was transferred to Delhi railway hospital for appendicectomy. After he had been in the latter hospital for about seven days and had been given rest and careful diet, he was prepared for operation as the condition of the appendix was considered quiescent. It seemed very likely that many adhesions were present, as on external examination

a considerable swelling in the right iliac fossa was discovered, which persisted in spite of rest and diet.

The abdomen was opened by a large paramedian incision. The anterior longitudinal muscular band of the cæcum was followed and after a good deal of search the appendix was felt tied down both to the cæcum and ileum by old-standing adhesions, and nearly doubled on itself. An attempt was made to free it from these adhesions but during this attempt it was discovered that they extended as far as the abdominal aorta. In consequence of this it was considered unwise to attempt further separation of the adhesions for fear of causing injury to the aorta. The adhesions that had been severed were sutured and the wound closed. In spite of the appendix not having been removed the patient has felt considerably easier since the laparotomy. He has been doing full duty for the last three months and is now apparently in perfect health. He remained in hospital for about three weeks after the operation. The relief in symptoms has most probably resulted from the disappearance of the swelling in the right iliac fossa as a result of the operation.

Cases 2 and 3.—A pointsman and a porter respectively were admitted into Delhi railway hospital during the same week. Both presented very nearly the same symptoms. A considerable swelling existed in the right iliac fossa in both cases. Both had low temperature for a few days, quick pulse, nausea and vomiting. With a week's rest and low diet in hospital the symptoms disappeared. When the condition became quiescent the patients were prepared for operation, and incision and other details of the operation were similar to those described above. The appendix in both the cases was found to be fairly adherent and was separated from the adhesions with great difficulty and removed in the usual way. The appendix in both cases was found to be very thick. Both patients have done very well and are now on full diet. They will be shortly discharged to duty.

My thanks are due to the Chief Medical and Health Officer, N. W. Railway, Lahore, for his permission to publish these notes.

HYPERPYREXIA IN DATURA POISONING

By S. D. KATAREY, B.A., L.M.P., L.C.P. & S. (Bom.)

Medical Officer, Basoda (Gwalior State)

THREE adult patients, two of whom were brothers and the third their uncle, were brought to my dispensary. They said that they had taken together some home-made *sattu* (flour of fried wheat and gram made into paste with sugar) in the morning, and since then were feeling very dizzy. They had come to the dispensary within one hour after their breakfast of *sattu*.

Although no foul play was suspected, they complained of gradual insensibility creeping over them. Zinc sulphate grs. xxx was promptly given to each of them by mouth and their stomachs were thoroughly and repeatedly washed out. Of the two brothers, the elder rapidly recovered except that he occasionally exhibited some nervousness. The remaining two patients, however, showed no signs of improvement and so the magistrate was called in to take their depositions but their speech had become quite incoherent by the time the magistrate arrived and hence he could not question them. Both of them gradually exhibited symptoms of datura poisoning, as described in a textbook. There was dryness of the throat and a very wide and equal dilatation of the pupils and congestion of the conjunctivæ. There was also the typical picking at the bed clothes and pulling of imaginary threads from the ends of the fingers. The speech became incoherent. This was followed by muttering delirium which deepened into coma. The insensibility was complete. I was almost certain that

these were cases of datura poisoning. There was, however, one symptom that perplexed me. Their temperature gradually began to rise and was 108°F. and 107.6°F. respectively in the axilla within about two hours of their admission to the dispensary.

Appropriate symptomatic treatment was adopted with systematic hydrotherapy to bring down the temperature. Consciousness gradually returned with the lowering of the temperature and the patients came round after about four hours. They were discharged cured with slight dizziness as an after-effect.

Hyperpyrexia as a symptom of datura poisoning is not generally mentioned in textbooks on toxicology. Lyons, on the authority of the Punjab Chemical Examiner's Report (1916), has cited three cases where the temperature rose to 105.4°, 107.4° and 108°F. respectively. The alkaloids atropine and daturine are known to raise the body temperature by 3 or 4 degrees. Their pharmacology in this respect is, however, uncertain; whether they do so by stimulating the thermogenic centre or by inhibiting the heat lost through the skin is not definitely known. No chemical examination of the vomited matter or the stomach washings could be made for want of facilities. The only reliable test for atropine (or daturine which is chemically allied to it) is physiological and not chemical.

The patients could not tell how datura happened to enter their *sattu*.

TREATMENT OF 'SUTIKA' (PUERPERAL DIARRHŒA) BY INJECTION OF GRAPE SUGAR SOLUTION*

By SURENDRA MOHAN ROY, L.M.P.

The Parada Pharmacy, Bukurpar P. O. (Pabna)

A WOMAN, aged 25 years, multipara, had had diarrhœa and indigestion from the sixth month of her pregnancy; this had become much more severe after delivery.

When I first saw her she had general anasarca, was extremely anæmic and so weak that she could not turn on her side unaided. She was passing stools involuntarily and these contained unaltered food particles.

She was given an intravenous injection of 50 c.cm. of 25 per cent sugar solution and a carminative mixture. Considerable improvement was noted after the first injection as the diarrhœa lessened and she was obviously stronger.

Two days later she was given a second injection of 100 c.cm. grape sugar solution of the same strength as the first, and thereafter eight more injections, gradually increasing the dose until the last one was 600 c.cm., and she steadily improved, and eventually recovered completely.

Her diet consisted of *atab* rice cooked with turmeric powder and *sing* fish broth in the morning and sago with goat's milk in the evening.

In my experience of twenty years' practice I have always found this type of puerperal diarrhœa, called *sutika* in Bengali, to be fatal, so I am publishing this note of a successfully treated case in the hope that others may try similar treatment.

Indian Medical Gazette

AUGUST

DRACUNCULUS MEDINENSIS

Dracunculus medinensis or the guinea-worm is, in some respects, one of the most interesting animal parasites from the historical aspect of parasitology.

It is one of the earliest parasites to be recorded in literature in a recognizable form, as it is conceded by all authorities that the 'fiery serpents' that scourged the Israelites near the Red Sea, and mentioned by Moses, refer to this species. A popular early name for this worm was the 'dragon worm' which gave rise to the term *Dracontiasis*, first used by Galen and still commonly employed to define the condition produced by infection with this helminth. Another outstanding fact in connection with the history of the guinea-worm is that in 1869 Fedtschenko indicated that it was transmitted from man to man by the medium of cyclops. This is practically the first step in the establishment of the vast amount of knowledge we now possess regarding transmission of parasitic diseases by all kinds of intermediate hosts. In justice to Kuchenmeister, however, it should be noted that really the first recognition of alternation of hosts of a parasite in more than one species of animal was his discovery in 1852 that certain bladder parasites in the muscles of animals were really the larval stage of adult cestodes found in the intestines of other mammals, and he was followed by Leuckart in 1854 who worked out the life-cycle of *Trichinella spiralis*. Strictly speaking, therefore, Kuchenmeister is the real pioneer in this field, but both in his case and in that of Leuckart the transmission was only between mammals, the definitive host eating the infected flesh of the intermediate host and thereby becoming infected with the adult parasite. Fedtschenko's observation is really very different from the above because the intermediate host he discovered was a water-dwelling Copepod, so it seems justifiable to give this worker full credit for an entirely original observation. Fedtschenko's work does not seem to have attracted much attention, probably because a considerable time elapsed before another intermediary was discovered, as it was not until 1878-79 that Manson discovered the transmission of *Wuchereria bancrofti* by means of our knowledge of intermediate host transmission proceeded more rapidly so that Manson's discovery is often quoted as the initial step in this great branch of parasitological science. But Manson considered that infected

mosquitoes died in water and the microfilariæ escaped from them into the water or else they escaped when the females were ovipositing, and that man was subsequently infected by swallowing the larvæ in water. This means of infection was soon shown to be wrong, and as it is not unlike the true method of transmission of guinea-worm it seems possible that Manson knew of Fedtschenko's discovery and received his inspiration therefrom.

In spite of the fact that the mode of guinea-worm transmission has been known for nearly sixty years, many discoveries of the details of how the infection actually occurs and how the adults become fertilized have, up to the present, defied all efforts of investigators, for although Leiper as long as 1906 obtained an infection in a monkey, from which two very small males and some immature females were recovered, and subsequent investigators have also found female worms in laboratory-infected animals, mature males have never been found, so there is a large gap in the life-cycle of this worm to be filled before full knowledge of it is obtained.

In the present issue we publish a paper in which remarkable success has been achieved, for several dogs have been infected and a great many adult worms recovered from them; many of these are undoubtedly males and their close proximity to the females in the connective tissue deep among the muscles suggests the probability that fertilization occurs there, before the female completes its journey to the subcutaneous tissues. This paper is apparently only in the nature of a preliminary note, but it is of considerable importance as its publication holds out bright prospects for the final and complete elucidation of this baffling life-cycle in the near future.

Since Leiper's original report of experimental infection of a monkey a considerable amount of similar work has been done in India. Turkhud's work published in 1912 is well known, but he had no success in infecting monkeys, and Fairley and Liston in 1924 were similarly unsuccessful with the same animals. They suggested that the species of monkey (*Macacus sinicus*) that they used was refractory, but it is difficult to understand why monkeys should be naturally 'immune' when such a diverse group of animals as man, dog, jackal, leopard, horse, cattle, sheep, goat and at least one species of gazelle have been found infected. Whatever is the cause of the many failures with monkeys the recent work of Issajev, who infected twenty-seven out of forty-two dogs but found no male worms, and that of Sweet and Moorthy published in this issue, indicate that dogs are the best laboratory animals so far used for this purpose.

The relatively great success of Sweet and Moorthy and the partial or complete failure of all other workers might repay study in detail to see if differences in technique or other

particulars can explain it, because this may be of help in indicating the hitherto imperfectly understood fact that the distribution of this infection is remarkably patchy in many countries, especially in India and West Africa, despite the fact that species of cyclops proved to be carriers are just as plentiful in many clean areas as in those where the condition is common.

If subsequent research can clear up these questions—and the prospects of this are much improved by this latest successful research—it is not beyond the bounds of possibility that a biological method of controlling guinea-worm infection may be evolved, and this will in all probability be much cheaper, more effective and more lasting in its results than the means which we have at our disposal at the present time.

Special Article

A FEW POINTS ON THE TECHNIQUE OF GASTRO-JEJUNOSTOMY

By J. F. SHEPHERD, M.B., Ch.B. (Aberd.), M.Ch. (Liv.),
MAJOR, I.M.S.

District Medical Officer, Malabar, Calicut

DUODENAL ulcer going on to pyloric stenosis is very common in southern India. Medical treatment relieves many of these cases, but as the careful dietetic regime necessary to complete the cure is seldom carried out for a sufficient length of time, a large number of cases present themselves to the surgeon in a state where operation is the only treatment holding out the prospect of permanent relief of symptoms on a normal diet and doing a normal day's work.

A properly done gastro-jejunosomy holds out this prospect.

With a good assistant and a trained theatre staff the operation presents little difficulty, but with an indifferent assistant and an unreliable theatre staff difficulties arise: the surgeon is compelled to take more and more upon himself and become independent of his surroundings. In the past two years I have worked in six hospitals with associates good, bad and indifferent. One of my assistants was so clumsy as to be a positive menace and it was in an endeavour to neutralize his clumsiness that some of the points to be described were thought out. Perhaps the results of my experiences will be of use to others.

Pre-operative preparation of the patient

Gastric lavage is carried out twice daily until the sour fœtid gastric contents are completely removed and the patient can swallow the Ryle's tube without discomfort. The patient's strength is buttressed by administration of glucose water by mouth and rectal glucose saline if vomiting is a marked feature. If necessary a soap-and-water enema is given one day before operation. An aperient is impracticable with a stenosed pylorus.

Anæsthesia of the abdominal wall

Local anæsthesia (Labat's method) is the anæsthetic of choice. In excitable patients 1/6 gr. omnopon used to be given an hour

before operation but as co-operation of the patient is required he should be in possession of all his senses so as to be able to exercise self-control. It has been found that nervous patients co-operate exceedingly well. Many patients especially those of the coolie class seem to dread a general anæsthetic and these are precisely the patients who co-operate best where novocain is used. So long as there is no actual pain discomfort does not seem to matter. No pre-medication is now given. 0.75 per cent novocain in normal saline with ten drops of 1/1,000 adrenalin per 100 c.cm. is the anæsthetic used. 150 to 200 c.cm. can be given without toxic effects and in very feeble patients the saline and novocain seem to benefit the patient.

A Moynihan syringe is used. An intradermal injection is given half an inch below and medial to the spot where the outer edge of the rectus abdominalis crosses the costal margin. A six-inch needle is then thrust slowly upwards and medially parallel to the costal margin and half an inch below it until the middle line is reached. The point of the needle is kept between the skin and the rectus sheath and 20 to 30 c.cm. novocain is injected as the needle is inserted so that a raised line of infiltrated subcutaneous tissue becomes visible along the track of the needle. If the raised line is not seen it means the needle is in the rectus sheath. The needle is withdrawn until only its tip is below the skin, the direction is changed and the subcutaneous tissues along the outer border of the rectus four to five inches downwards are infiltrated in the same way. The sensitive anterior rectus sheath is now anæsthetized and subsequent manipulations are almost painless, a most important point if the patient is to retain his confidence in the surgeon. The needle is again withdrawn until only its tip is under the skin. Holding the syringe with a very light touch the surgeon brings the needle to a position at right angles to the surface of the body and presses the point onwards until his sensitive fingers feel it pierce the rectus sheath: 10 c.cm. of the solution are then injected. The thickness of the rectus sheath varies in different subjects and it is essential that the surgeon should know when the needle has pierced it. The easiest and most certain way of blocking

the intercostal nerves to the rectus is by sliding the needle through the infiltrated subcutaneous tissues for an inch, dipping the point through the sheath and injecting 10 to 20 c.cm. novocain as the needle slowly goes onwards inside the sheath for another inch or two. So long as novocain is being injected at the same time as the needle is advancing, the danger of piercing the posterior rectus sheath and damaging abdominal viscera is negligible. The needle point finds its way automatically into a plane between the rectus and its posterior covering and the injected fluid pushes the sheath backwards, protects it and prevents penetration into the peritoneal cavity.

The needle is used in this way inside the rectus sheath first upwards and medially parallel to the costal margin and then downwards along its outer border. The needle is then completely withdrawn, the whole series of injections having been made through one skin puncture.

The opposite side is then dealt with after the same fashion. Being left-handed I find it convenient to inject the right side first and then to remain on the right side of the patient and inject the left side from above downwards. The easiest way is to walk round to the other side and repeat the injections there exactly as was done on the right side. Both sides should be anaesthetized as then perfect muscular relaxation results. In a favourable case where the abdominal wall is flat and the rectus and its sheath thick and well defined multiple punctures of the sheath are unnecessary and the needle once inside can be swept onwards in one movement. With a very emaciated patient whose abdomen is markedly sunken, it is impossible to keep the needle parallel with the visualized plane of the posterior sheath and multiple punctures may be necessary. Even then the manipulations do not occupy 10 minutes.

Incision

A four-inch right paramedian incision is made, the lower end being one inch above the umbilicus. If the appendix is to be removed the lower end is at the level of the umbilicus but this is not done as a routine unless there is some suspicion of its having caused trouble. Where a tendinous intersection is encountered the rectus sheath is incised transversely above and below as this obviates all possibility of damaging the muscle, and compensates for the little extra time taken. Retraction of the limp rectus outwards reveals the novocain lying posterior to the muscle where the nerves pierce the sheath.

Splanchnic anaesthesia (Braun).—The patient is told he will suffer a little pain. The surgeon's right hand very gently enters the peritoneal cavity, insinuates itself between the stomach inferiorly and the liver superiorly so that his index, middle and ring fingers rest on the gastro-hepatic omentum just above the lesser curvature. Slowly the fingers press

posteriorly until the abdominal aorta is felt and the sulcus to the right between it and the vena cava is identified, the ring finger lying on the aorta and the index finger on the inferior vena cava. The long middle finger is pressed into the sulcus until the body of the first lumbar vertebra is felt, only the peritoneum intervening. A needle eight inches long is then guided on the motionless fingers until its point is touching bare bone. It is then connected with a glass syringe and 30 c.cm. of 0.75 per cent novocain adrenalin saline injected slowly in three lots of 10 c.cm. each. The first lot is made with the needle on the bone and makes thick and oedematous the tissues in which the coeliac ganglia and nerves lie. The point can then be withdrawn a little and the other two portions injected more directly into the proper tissue plane without risk of the point of the needle being anterior to the peritoneum covering the ganglia. The immediate effect of this injection is to stimulate the heart. Probably it is the adrenalin that causes this. The patient is conscious of a thundering pulse and the surgeon feels the increased pressure of the aorta pulsations. This lasts but a few minutes.

Blocking the vagi

The hand is now gently pushed up and to the left and the cardiac end of the stomach and the termination of the oesophagus identified. A loose fold of peritoneum can be picked off the anterior aspect of the latter by the thumb and index finger. This is held firmly while an eight-inch needle is being guided into it and then 10 c.cm. of the anaesthetic is injected. If properly done a fluid 'blister' is felt forming round the cardio-oesophageal junction.

Prior to adopting this technique a few patients used to vomit while the operation was being done, obviously a most undesirable happening. The sickness and vomiting may have been due only to lowered blood pressure, prolonged operative discomfort and nervous upset; but it was felt that the trauma done to the stomach wall might be sending afferent impulses by way of the vagi, setting up a series of efferent impulses through other fibres of the same and other nerves resulting in vomiting. This reasoning may not be quite accurate. Accurate or not an injection of 10 c.cm. 0.75 per cent novocain adrenalin saline has been made at the cardio-oesophageal junction in the last 30 cases of gastro-jejunoscopy done by me. Of these three have co-operated badly and required general anaesthesia. Not one of the thirty has become sick during operation nor shown any signs of wishing to vomit. There has been no post-operative vomiting.

It is felt that this injection is a most valuable one.

The most obvious advantages of the local over the general method of anaesthesia for abdominal operation are:—

(1) The surgeon is independent of the services of an anaesthetist.

(2) The patient is relieved of the agonies of post-anæsthetic vomiting.

(3) Pulmonary complications are fewer.

(4) Muscular relaxation being perfect, ease of operating through a small incision is obtained. The length of the incision depends on the size of the surgeon's hand which must glide easily into the peritoneal cavity when necessary.

During the course of the operation the patient usually has one or two bad spells. His blood pressure falls and his face becomes grey and livid. A few drops of ether on a mask is a most excellent and grateful restorative. It is sometimes forgotten that ether is a very good stimulant and given in doses of five or six drops it revives the drooping spirits of the patient during the operation in a most wonderful way.

Exploration of the abdomen

The pylorus and first part of the duodenum is exposed and the obstruction demonstrated. In the event of none being found the entire abdomen is systematically explored.

Arranging the gut for suture

The transverse colon and stomach are pulled gently out of the abdomen, wrapped in a hot wet pack, and given to the assistant to hold. An avascular area to the left of the middle colic vessels in the inferior aspect of the transverse mesocolon is then found and incised for two and a half to three inches with Mayo scissors to open into the lesser sac and expose the posterior wall of the stomach. The right index finger is passed into the lesser sac, any adhesion explored and divided as necessary, and the stomach pulled forward by the finger hooked into the lesser curvature. The latter is carefully examined and the site of the end of the proposed stoma and suture lines on the lesser curvature visualized lying between two sets of vessels. The site having been fixed, a point just to the left is seized with a pair of de Vilbis basting forceps and these given to the assistant to hold.

The blades of the de Vilbis forceps consist of two wires, one pointed and bent at a right angle for the last quarter of an inch, the other U shaped at the end, the point of the first blade going into the U. When closed it is really the U that grips the stomach and not even the clumsiest of assistants can tear the viscus by pulling too hard—a great advantage over a simple guide suture. The greater curvature of the stomach is now pulled through the hole in the transverse mesocolon and straightened out, the site of the entire stoma visualized on the now exposed posterior wall of the viscus and its lower end marked by applying a second pair of de Vilbis forceps to a point on the greater curvature just to the left of the selected site. The finished stoma should be about two and a half inches in length just to the right of the right border of the œsophagus, vertical in direction and having its lower end on the greater

curvature, thus draining the most dependent part of the stomach.

Traction is now made on the de Vilbis forceps so as to make taut the piece of stomach between them. The forceps on the greater curvature is pulled down and to the right and held there by the assistant so that the site of the proposed stoma now comes to lie transversely. The duodeno-jejunal flexure is found and a loop of jejunum running down from it, delivered out of the peritoneal cavity.

A glass rod eight inches by one-quarter of an inch wrapped in a few thicknesses of gauze is now placed across the operation field and the jejunum united over the rod to the stomach by two long sutures of fine (0) catgut. These two sutures are carefully placed. The first is made by piercing the stomach wall at a point near the lesser curvature just to the right of the fixing de Vilbis forceps, selecting a spot so that when the stoma is being made this corner will not be complicated by the presence of the troublesome vessels. The needle then is carried over the rod and made to pierce the jejunum. The latter is held so that it pulls taut on the duodeno-jejunal flexure and is brought to lie on the lesser curvature without tension. At this level the needle pierces the bowel midway between the mesenteric and antimesenteric borders, the stitch is completed and tied over the glass rod.

A similarly placed stitch unites the greater curve to the jejunum so that a loop of the latter comes to lie approximately to the stomach, with its proximal end stitched to the lesser curvature and the distal end to the greater curvature. In each of these stitches the catgut is long and the needles left threaded.

The assistant now makes the stomach wall taut by pulling lightly on the de Vilbis forceps and a Lambert's stitch is introduced from left to right (lesser to greater curvature) from the first stitch to the second using the long end of the first fixation stitch. This, the posterior serous suture, is anterior to the glass rod which now holds the stomach with jejunum firmly in position during the rest of the operation and facilitates greatly all subsequent manipulations (figure 1). The large bowel is pushed back

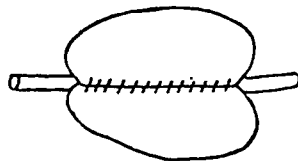


Fig. 1.

into the peritoneal cavity and the operation field packed off with moist towels. The de Vilbis forceps may now be removed.

The operation proper

With a sharp knife an incision parallel to the Lambert suture line and little more than

a quarter of an inch from it is made in the stomach, the ends being a little short of the ends of the Lembert's suture. The incision is made with several light strokes of the scalpel and deepened until the submucous layer is reached and the mucous membrane bulges into the wound from end to end. A little saline emphasizes the natural colour of tissues and, when this has been dabbed on, the larger vessels lying in the exposed submucous layer of the stomach become very plainly visible (figure 2). Each

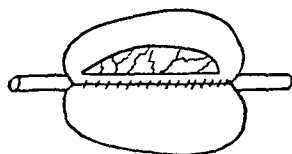


Fig. 2.

is underrun in two places with a curved needle and tied with fine catgut. This prevents hæmorrhage both immediate and post-operative and yet does not impair the blood supply of the stoma as tying the vessel on the curvatures is apt to do.

This field is surrounded by red towels and the stomach is opened by cutting the mucous membrane along the whole length of the incision in the muscle coats. This is done by making a small opening with the knife at one end and completing the section with blunt-pointed scissors taking care to cut the vessels between the two ligatures previously applied on each artery.

The jejunum is opened along the mesenteric border in a similar way but it is useless searching for vessels in the submucosa as none can be found. Any spurting point in the mucosa must be seized in fine forceps and tied.

The first through-and-through mattress hæmostatic suture of no. 0 catgut including all coats is now introduced beginning at the middle of the cut surfaces and continuing until the end is reached (figure 3). Special care is taken at

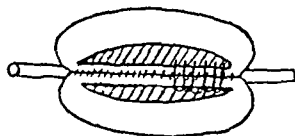


Fig. 3.

this point to ensure that the ends of the openings in the stomach and jejunum come into accurate apposition by inserting the last stitch of the row just outside the end of the incision in each viscus. When this has been done the thread will emerge from the stomach mucosa and the surgeon has next to turn the corner. To do this he inserts the needle back through the stomach wall so as to emerge near the corner but on the anterior margin and then brings the mucous surfaces of the jejunum and stomach together by inserting the needle from peritoneal to mucous surface of the jejunum and

from mucous to peritoneal surface of the stomach (figure 4). The anterior mattress

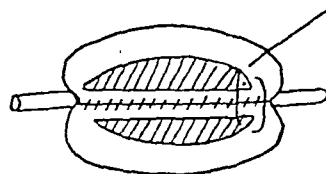


Fig. 4.

hæmostatic through-and-through continuous suture is then carried on for about an inch, the ends tied and left long, clipped by a light artery forceps (figure 5).

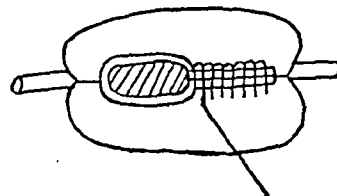


Fig. 5.

It is to be noted that, whereas the posterior through-and-through suture brings two peritoneal surfaces together, the anterior one approximates the mucosa of the stomach and jejunum. This ensures that the cut edges are always under the eye of the surgeon. Bleeding points if any can be seen are dealt with very easily, but, much more important, this method of suturing makes certain that the stitches can be introduced so as to make the mucous membrane protect the cut edges of the muscle layers from the action of the gastric and other digestive fluids. The destructive action of peptic enzymes on the uncovered cut edges of the muscle layers of the stomach and jejunum is usually a cause of a peptic ulcer on the stoma after operation. The posterior part of the through-and-through suture should therefore be carefully inspected and if any of the raw muscle edge is showing an extra stitch should be inserted to cover it with mucous membrane. The anterior part of the through-and-through suture automatically protects the muscle edges. The other half of the posterior through-and-through suture is next inserted, beginning close to the previous one to the end of which the thread should be tied and the ends cut short. A continuous mattress suture is applied and the corner turned as before. If the assistant then holds up the ends of the first through-and-through suture on the anterior surface the two

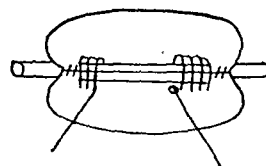


Fig. 6.

cut ends, mucosa inwards, fall naturally into line and the anterior suture can be completed, very easily, tied and cut short (figure 6).

The red towels and the instruments used after opening the stomach are now removed, the hands rinsed and fresh instruments employed.

The needle left on the long thread originally used to tie together the greater curvature and the distal part of the jejunal loop is next picked up and the anterior serous suture is inserted. This suture is rather more difficult to insert than the others especially for the first two or three stitches when vessels on the greater curvature are apt to be in the way and may be pricked. A continuous Lembert stitch is used and carried on until it is one stitch beyond the end (left long) of the posterior serous suture to which it is then tied. This ensures that all the raw edges on the anterior portion of the stoma are properly covered with peritoneum. In inserting this suture line there is always a tendency to pick up with successive stitches pieces of the jejunum further and further from the stoma until the mesentery is reached. This must be prevented and every endeavour made to insert the stitches as near the stoma as possible.

Catgut excites considerable reaction in the tissues especially at the knots, and having the knots of the through-and-through sutures in the middle of the stoma while the knots of the serous suture are at the ends is a real advantage as it distributes the load of healing on the tissues, instead of concentrating it at the corners.

The glass rod which has held the stomach and jejunum immovable while the stoma was being made is now pulled out, the stoma gently lifted up and the gauze that surrounded the rod pulled out likewise. The abdominal packs are removed and counted. The transverse colon is pulled out and five or six separate stitches inserted so as to bring together the edges of the hole in the transverse mesocolon and the stomach wall near the stoma. This prevents herniation of the small intestine into the lesser sac.

The transverse colon, stomach and jejunum are next replaced into the peritoneal cavity and allowed to assume their natural positions. When the surgeon sees the stomach lying normally and feels his fingers invaginate the anterior wall of the viscus into a stoma lying in line with the right border of the œsophagus, vertical in direction, a good three finger-breadths in length, he can congratulate himself on having accomplished his task and done it well.

The abdominal incision is closed in layers.

Post-operative care

The most comfortable position for the patient is the Fowler's position. Rectal glucose saline is commenced immediately the patient comes from the theatre about four pints being given in the first 24 hours.

The stomach tube is passed on the same evening or on the next morning as a routine and the stomach emptied of its contents—saliva, mucus and water, a little bile and stale blood. About a pint is drawn off in the evening and half a pint next morning as a rule. The patient having been previously trained to swallow the Ryle's tube before the operation, does so at this stage without discomfort and invariably states that he feels very much better afterwards. The reaction of any viscus to injury is to stop work and concentrate its energies on repairing itself. The injured stomach and jejunum remain motionless after operation for 24 hours at least and therefore all fluids finding their way there collect and remain until removed either by the stomach tube or by resumption of peristalsis one or two days later.

Sips of water, lemon-flavoured if preferred, may be given but as nothing is absorbed from the stomach this does not relieve thirst. For the first 24 to 48 hours after operation rectal glucose saline must be relied upon to provide all the fluid and energy necessary to the patient.

A soft rubber catheter is passed about 9 p.m. if no urine has been passed until then. The use of the catheter is not often required after this.

The period when most pain is felt is about 12 hours after operation. Morphia should not be given as it provides no real relief to the patient, makes him feel very heavy and nauseated next morning and predisposes to flatulent distension; he is much better left alone. At the end of 48 hours most of the pain has gone and after 72 hours the pleasant part of convalescence has begun.

After the fourth day the stoma is sufficiently firmly healed to allow mild liberties to be taken and if a little piece of bread or a biscuit be desired there is no harm in indulging the patient's fancy. Diet, however, is mainly fluid until the 21st day when a normal meal at long last can be allowed and is highly relished.

Summary

The patient is trained to swallow a Ryle's tube before operation.

Local anæsthesia is used, consisting of infiltration of the intercostal nerves as they enter the upper part of each rectus sheath to give perfect muscular relaxation: splanchnic block (Braun's method) to anæsthetize the viscera: block of the vagi at the cardiac end of the stomach to prevent vomiting. A glass rod is used to steady the stomach and jejunum while the stoma is being made.

The stomach is emptied by a Ryle's tube 12 hours and 24 hours after operation as a routine.

Medical News

SIR HENRY HOLLAND, KT., C.I.E.

THROUGH a clerical error the name of Dr. H. T. Holland was omitted from the Birthday Honours' list published in our July issue. That the new King-Emperor has honoured Dr. Holland by conferring on him a knighthood is a matter of very great satisfaction to all those who knew Dr. Holland or knew of the magnificent work he has done in Quetta, especially since the disastrous earthquake to which he almost fell a victim.

It is only rarely that the non-official European Medical community in this country receives an honour beyond an occasional Kaiser-i-Hind medal and we are sure that its members will agree with us that no more suitable individual could have been chosen for what amounts to almost a new departure in this distribution of honours in India; we say almost, as Sir William Wanless was similarly honoured some years ago.

We offer Dr. Holland our heartiest congratulations.

THE NAIR HOSPITAL DENTAL COLLEGE PROSPECTUS, 1936-37

WE have received a copy of this publication and give below a brief abstract of the history of this new dental college. The figures indicate a steady and rapid advancement showing such a college was an urgent need in Bombay and by the increase in the number of students entering it that the importance of dentistry in India is fully appreciated.

Historical.—The late Dr. A. L. Nair endowed the Bai Yamunabai L. Nair Charitable Hospital in the year 1925. It soon became popular on account of being located in a locality where it was badly needed and a separate dental department was started with only one dental chair. Dr. V. M. Desai, the present Dean of this college, was entrusted with the department in the year 1927 and he was assisted by Dr. A. P. Kothare and Dr. D'Lima and thereafter by Dr. N. F. Vaid and Dr. V. P. DeSa. The demand was great and in 1930 it was found necessary to add another dental chair. In 1931, the dental department admitted graduates for specializing in dentistry as an experiment and this innovation was warmly welcomed. In 1932-33, Dr. V. M. Desai conceived the idea of establishing a dental college and an experiment was made by admitting eight advanced dental students for training.

According to the necessity the clinic has expanded and more dental chairs were added. The following table indicates fully the progress of the college:

Year	Number of students	Dental chairs	Patients treated
1932-33	4 post-graduate students.	2	..
1933-34	8 advanced dental students.	..	..
	8 regular students	6	5,296
1934-35	30 " "	12	6,825
1935-36	49 " "	23	4,300
			'June to November'

In 1934, the college was re-organized. More chairs were added to the clinic, making the total number 23. A separate general anaesthesia and oral surgery department was opened with nine chairs in the department. A separate well-equipped laboratory for practical dentistry was also added. The course of study was also extended to three years. The first batch of eight graduates were awarded college diplomas, the total number of students on the roll being 30 at that time.

In the year 1935 the college continued to progress and to-day there is a most modern and well-equipped dental clinic with 23 dental chairs and two well-equipped laboratories.

[The syllabus occupies over 120 pages of the prospectus and appears to give a remarkably comprehensive scheme of instruction, which if fully followed will turn out remarkably well-qualified dentists. We wish this institution all success in its pioneer work in Bombay.]

THE EAST GODAVARI DISTRICT MEDICAL ASSOCIATION, COCANADA

*Minutes of the meeting held at Amalapur on the
30th May, 1936*

A MEETING of the East Godavari District Medical Association took place at Amalapur on 30th May, 1936. Thirty-one members attended the meeting. After an enjoyable tea the proceedings of the meeting commenced with Captain J. S. McMillan, I.M.S., in the chair. Dr. A. Umapathi Mudaliar of Amalapur exhibited a very interesting case of pulmonary stenosis in a boy aged 12, a case of congenital syphilis in a child of 2 presenting bony prominences in the skull and another case of malignant growth in the neck, probably lymphadenoma, pushing forward of the posterior wall of the pharynx and causing protrusion of one eyeball. Dr. N. S. Reddi of Amalapur read a paper on typhoid fever. Dr. A. Perisastri of Amalapur one on tetanus. There was a dinner after which the guests and members dispersed.

THE PRESCRIBER

THE May issue of the *Prescriber* is devoted entirely to endocrinology; it is the 16th annual issue on this subject. The various glands are dealt with in turn—thyroid, parathyroid, adrenal, pituitary, pancreas, etc., while the female and male reproductive systems are very fully treated. It is interesting to note that in this last section the work has been reviewed as late as April of this year. Each chapter begins with a brief summary of the present position relating to that particular gland and this is followed by a review of the literature during the past twelve months. The number, which runs to 68 closely printed pages, thus presents a complete synopsis of the position to-day, and should be most useful for reference by practitioners. It is published by the *Prescriber* offices, 65, Castle Street, Edinburgh 2, and the price is 3s. 6d., post free.

Current Topics

Constitutional Medicine

(From the *Medical Journal of Australia*, Vol. I,
21st March, 1936, p. 405)

DURING recent years clinicians have, in the treatment of disease, paid increasing attention to the constitution of the patient. This is not a simple reversion to the point of view of our forefathers, who knew little of infective agents, of bacteriology and of the changes wrought by micro-organisms in the tissues of the body. It is what may be called a renaissance in which new knowledge is being correlated with old. Though the newer outlook began to be manifest early in the century, it received a great impetus during the World War, in which the huge masses of men in 'vast outdoor clinics' were studied, supervised and treated as never before in the history of mankind. The study of genetics, of biological chemistry and the science of endocrinology have also been factors in the reawakening. The present conception of the constitution of man has been described as the summation of inherited traits which are basic in resistance, susceptibility and predisposition to disease. Dr. Robert Hutchison in his Herbert Maitland Oration delivered last September

gives the term wider significance. He regards the constitution as the total make-up of the individual, physical and mental; and he explains that constitution in this sense is partly inborn and so may be inherited, and in part is the effect of environmental influences. Constitution to him is not a static condition; rather is it in a state of flux which varies to some extent from day to day and even from hour to hour.

Dr. Hutchison describes three components in constitution as defined by him; the first is the anatomical or morphological, the second is the physiological or functional, the third embraces the psychological, the intellectual and emotional peculiarities and reactions which the person exhibits. These three components are closely interrelated and react on one another to produce a trinity in unity, the chief integrating factors being the vegetative nervous system and the hormones acting through the blood. Anatomical differences in constitution have been determined, and the two extremes, the asthenic and the pyknic, the lean and lanky and the short and stocky, are well known. Dr. Hutchison thinks that other anatomical divisions may be rather artificial. He also thinks that some of the attempts to give to different morphological types a diathetic significance have been rather far-fetched. He admits, however, that the asthenic type of constitution is found in common experience to predispose to such conditions as pulmonary tuberculosis, to the atonic form of functional dyspepsia and to nervous exhaustion, and that persons of the pyknic type are more subject to asthenic conditions, such as primary hypertension and the hypertonic form of gastric derangement. In referring to functional differences in constitution or the variations in 'physiological personality', Dr. Hutchison distinguishes between differences in the working of the machine as a whole: metabolism; and differences in the working of its individual parts: the organs. Unfortunately it is impossible to refer to all the subjects that he mentions in this regard; it is interesting, however, to note that Dr. Hutchison thinks that it is safe to postulate inborn or acquired constitutional differences in the vulnerability of the erythron which may determine liability to some forms of anæmia; it is certain also that there are variations in the fragility of the red cells and in the blood coagulability. The ductless glands offer the most important contribution to the individual make-up. There is, Dr. Hutchison thinks, a tendency at present to exaggerate this contribution; and most physiologists will agree with him. 'The present-day view of their importance may well be summed up in the statement of Loebel that we have learned to look upon the 'humours' as 'hormones'. Dr. Hutchison made but passing reference to the psychological aspect of the constitution.

What we have called a renaissance in medicine is described by Dr. Hutchison as constitutional medicine; it is also known as neo-Hippocratism and individual medicine. It is based on 'tripartite constitutionalism'. The definition of a constitution as non-static must be accepted. If the constitution were regarded as static it might be held that it was basic for all branches of medicine; and from these premises it has been argued that medicine becomes a vassal of anthropology. This, however, is not really germane to the present discussion. Medicine has become more and more concerned with the individual; it will surely progress along these lines. 'Constitutional medicine teaches us to look for syndromes rather than for cut-and-dried diseases, its aim being to find out what is wrong with the working of the medicine in any of its parts'. It also 'naturally predisposes us to look for remote causes for local effects'. Thought and work along the lines drawn by Dr. Hutchison will undoubtedly yield results. 'Such an outlook also enhances the dignity and importance of our art, for by the influence which we are able to exert on constitution, and through it on behaviour we become one with the great mental and spiritual forces that mould mankind'

Boils and Carbuncles

By JOHN FRASER, M.C., M.D., Ch.M., F.R.C.S.E.
(Abstracted from the *Practitioner*, Vol. CXXXVI,
April 1936, p. 350)

Boils and carbuncles are often ranked among the minor maladies that afflict mankind, and the former particularly are so common that it is apt to be overlooked that they sometimes form the initial lesion in a train of events ultimately having the most serious and even fatal consequences.

DEFINITIONS

To begin with, the definitions applied to these conditions may be recalled. A *boil* is the result of a staphylococcal infection of a hair follicle, a sweat gland or a sebaceous gland. A *carbuncle* is a staphylococcal infection of the cutis vera or corium and of the subcutaneous tissue which merges with it. It is important to insist upon the distinction in site incidence between the two conditions, for it plays a significant part in the clinical history and physical signs of the respective lesions.

THE INFECTING AGENT

The staphylococcal organism is the infecting agent, and it is generally believed that the *Staphylococcus aureus* is the strain responsible for boil and carbuncle formation. Recent work (Burnet) has shown that pigment characteristics do not necessarily indicate different strains, for a *Staphylococcus aureus* may have *albus* variants, and yet the constancy with which the *aureus* variety is isolated from boils and carbuncles would seem to suggest its particular importance in originating these lesions. Various toxins are produced by staphylococci—two have been isolated, alpha and beta, but it is probably the former which plays the important part in human skin infections. It is hæmolytic, and in virtue of the fact that it contains a leucocidin it destroys white cells. In large doses it is lethal to animals, and in the skin and subcutaneous tissue it has the effect of producing localized necrosis. This last property is of special significance in the pathology of the conditions under discussion. Recent methods of immunizing antigen treatment are based upon a knowledge of the staphylococcal exotoxins.

THE ORIGIN OF A BOIL

How does the staphylococcal infection gain entrance to the hair follicle. The organisms are constantly present on the surface of the skin, particularly the *Staphylococcus albus*, and it is surprising that boils are not more frequently encountered. Under ordinary conditions organisms would find it difficult to enter the deeper portions of a hair follicle because, though a potential space exists between the outer and inner root sheaths, these structures are actually in contact. Infection may enter the shallow pit which lies around the hair and pass into the sebaceous gland which opens on one side, but this possibility is lessened by the secretion of the gland which not only fills the gland cavity, but, as it is secreted, tends to carry an entering infection in an outward direction. It is also probable that the sebaceous material has a certain degree of natural resistance to infection. It is when the hair has been shed that infection is most liable to occur—the space is now open, the epithelium covering the papilla has not yet proliferated in the formation of a new hair, and this is the time when organisms are most likely to gain entrance. Staphylococcal infections of the sebaceous and sweat glands are generally classed as true boils, but it is exceptional for them to develop in an acute fashion, probably for the reason that the sebaceous and sweat gland products show some resistance to bacterial growth. It is in the hair follicle proper that the conditions are most favourable. The outer root sheath is relatively avascular, and the papilla, although it contains a copious blood supply, is isolated by the epithelial covering from which the new hair will develop. The natural powers of resistance

are therefore deficient, and the infection advances unchecked. It destroys the cells of the outer root sheath, and presently it makes its way beyond the walls of the follicle into the peri-follicular space. There it encounters an increased resistance for it meets the fluids which pour from the surrounding blood and lymph vessels, and its progress is finally arrested by the formation of a zone of granulation tissue—a demarcation line which limits the infection completely. It is important to appreciate that the invasion does not extend up to the papilla because the vascularity of that portion is so great that it provides a powerful barrier to a downward spread.

In a fully developed boil, therefore, the pathological picture is somewhat as follows: The cavity of the follicle is filled with pus and inflammatory debris. The walls have undergone necrosis so that they exist as a yellow slough or core, and around the central necrotic area, and most intense in the region of the papilla, there is a zone of reactionary tissue which, by exerting its phagocytic activities, establishes a line of demarcation, thus ultimately securing the complete separation of the central slough. The cavity from which the slough has separated is lined with granulation tissue, and in a relatively short period of time the space becomes filled in and surface epithelium completes the closure.

SYMPTOMATOLOGY

The signs and symptoms of boil formation are so well known that it is unnecessary to allude to them in any detail. The sufferer's attention is drawn to a sense of itching and discomfort at an individual point of the skin surface, and when he examines the part he finds the cause in a small but highly sensitive, pimple-like projection. Examination of the area under a hand lens shows that the pimple is umbilicated at its centre, and from this point (the opening of the hair follicle) serum is escaping. The pain becomes appreciable as the result of increasing tension within and around the hair follicle, and in time it grows quite severe and of a throbbing and insistent character. At this stage, when increased tension has led to absorption of toxin, a general disturbance may develop—rise of temperature, loss of appetite and a sense of malaise—but with the separation of the slough there is immediate improvement, both local and general. During the acute stage of the disease the lymphatic glands which drain the infected area may enlarge and become tender, but it is exceptional for a glandular abscess to form, probably for the reason that the actual microbial infection remains localized, and what glandular disturbance does take place is the result of toxin absorption.

TREATMENT OF THE BOIL

The danger of incision.—The most important recommendation in regard to treatment is a negative one, namely: *Never incise a boil.* It is admitted that the advice may seem unusual and even paradoxical, for, although views on these matters are changing, there are many who cling to the surgical adage: 'When pus is present, let it out'. In this instance, however, there is a particular reason why incision of the infected area should be avoided. Now wherein does the danger of such a procedure lie? The walls of the hair follicle are relatively non-vascular, but the papilla which projects into the base contains not only a copious arterial supply, but also one or more large venous sinuses—large, that is to say, in comparison with the general relationship of the parts. These sinuses lie at the base of the papillary mass of cells; their walls are devoid of muscular tissue, and, if they are incised, there is little tendency for retraction and spontaneous closure to occur. It is evident, therefore, how great are the risks of incision through a septic field if at the same time these sinuses are opened. Infection gains entrance, and being a venous infection the dangers of septicæmia and pyæmia are considerable. In my opinion so great are the risks that I would strongly

urge that in no circumstances should a boil be incised. But apart from the risks of inducing a blood infection, there are local reasons why a boil should not be punctured nor incised.

The lesson to be learned from experience is this: a boil is essentially a localized infection, and if it is allowed to develop on ordinary lines it will remain so. Incision or puncture may temporarily improve the drainage, but it is doubtful if any such assistance be required, and there is always the risk that there may result from interference a serious extension of the infection. I have thought it wise to utter this *caveat* because I am as satisfied of its importance as I am convinced of the risks run if it be ignored.

Surface applications.—It may be that the best line of treatment to adopt is to allow the local lesion to run its course undisturbed, taking precautions to prevent further infection of the surrounding hair follicles or sweat glands, but the passivity of this attitude seldom appeals to the patient, and the practitioner feels bound to adopt more active measures.

The most popular treatment is to apply heat to the part. It is comforting to the sufferer, and no doubt it increases the reaction in the part and hastens the separation of the slough. But care must be exercised in the means by which heat is applied. The old-fashioned linseed or bread poultice is very soothing, but it makes no pretence to antiseptic value, and under certain conditions and in certain positions its use is impossible. It also arouses the criticism common to all moist dressings: it encourages the development of further boil formation in the skin area which it covers. The hot boracic fomentation is still less desirable for, while it has all the disadvantages of a poultice, it does not retain its heat for any length of time. The same criticisms apply to the popular application of magnesium sulphate in glycerine (20 per cent). A pad of antiphlogistine a quarter of an inch thick and of appropriate size is one of the best applications. Raised to a temperature as high as can be borne with comfort, it retains its heat for quite a long period of time, while the oil of wintergreen which it contains gives it certain antiseptic properties. The method of applying it is as follows:—

The skin surrounding the boil having been washed with alcohol, a small amount of ammoniated mercury ointment (2 per cent) is rubbed into the part in order to lessen the possibility of surface infection. The heated antiphlogistine pad is then placed between two layers of sterile gauze and laid over the boil. A layer of cotton-wool helps to retain the heat, and a crêpe bandage keeps the application in position. The dressing is repeated as often as may be necessary—probably every four hours—and is continued until the slough has separated.

Desiccated magnesium sulphate and glycerine (2½:1½) may be substituted for the antiphlogistine, the paste being heated to an appropriate degree and applied between layers of sterile gauze. Following the separation of the slough, the granulation cavity which remains is dressed with an antiseptic lotion, such as eusol or acriflavine, or a solution of aluminium acetate (10 per cent) may be used to hasten the healing process. Scarlet red ointment is a useful dressing in the later stages.

Boils of a subacute type may respond in a satisfactory fashion to antiseptic ointment application. A reliable preparation of this nature is made up as follows:—

R Phenol	..	..	..	1 part
Camphor	..	..	..	3 parts
Salicylic acid	..	..	..	2 "
Lanolin-vaseline	..	..	..	94 "

A thick layer of the ointment on a piece of lint is laid on the boil and changed as often as required. It has soothing properties, its antiseptic action prevents secondary infection of the skin, and, moreover, it appears to hasten the separation of the slough.

METHODS OF ARRESTING BOIL FORMATION

Many attempts have been made to formulate a treatment by which a boil may be arrested in the early stages, and an efficient method of this kind would be a great advantage because, if allowed to run its full course, the infection may extend over ten to fourteen days or even longer. Some of the measures employed have distinct possibilities. One of the simplest plans (and one which is often efficient) is to sterilize the focus by means of pure carbolic acid. A pointed, sterile match stick or orange wood stick is dipped in the carbolic acid and inserted into the centre of the boil by a rotary movement. If this is done gently and steadily there is remarkably little pain. A dry sterile dressing is applied, and it is important that no fluid be allowed to come into contact with the part, for, if this should happen, the subsequent spreading of the carbolic will result in necrosis of the tissue for some distance beyond the limits of the boil. Ultra-violet light and x-rays have been used to arrest the infection with varying degrees of success. The rays are concentrated upon the focus by means of a lead shield perforated in the centre to expose the boil. The ultra-violet applications are given for periods of three minutes each day, the lamp being set at a distance of four feet from the skin surface. X-ray treatment is given daily for periods of two minutes. Following these applications the area is dressed with ichthyol ointment (20 per cent).

It has been claimed that it is possible to abort a boil by injecting the contiguous tissue with a small quantity of the patient's blood. Normal blood serum contains rather less than one unit of staphylococcal antitoxin per cubic centimetre, but in the presence of a staphylococcal infection this may rise to five or more units per cubic centimetre. It was suggested, therefore, that the course of the infection might be cut short by a local infiltration of the immunized blood. The method is as follows:—

Ten cubic centimetres of blood are withdrawn from the patient's vein into a Record syringe, and the fluid is at once injected at four or five points around the periphery of the boil at a distance of about three-quarters of an inch from its centre. The results have not been uniformly encouraging, but that there are possibilities in the method would seem to be indicated by the fact that sometimes there is considerable local reaction with swelling and pain.

Vaccine treatment.—The vaccine treatment of boils, and particularly the type of case in which successive crops of infection arise, has been under trial for a considerable time. The results are difficult to assess. Sometimes the effects are most satisfactory, but in other instances no appreciable benefit follows. An autogenous vaccine appears to be the most reliable. Recently a staphylococcus toxoid (i.e., a staphylococcus toxin to which formalin has been added) has become available; a vaccoid (a combined vaccine and toxoid) has also been prepared. These preparations are supplied in weak and strong solutions, the latter being five times the strength of the former. The dosage is from 0.1 cubic centimetre to 1 cubic centimetre and the injections are repeated every third day. The weak solution is indicated in the case of children or in adults who show unusually marked reaction. This method of treatment is still under trial, and, if the results are satisfactory, it should prove of value in a most difficult type of case—the recurrent boil.

Drug treatment.—Many years ago the pharmacologists drew attention to the fact that the salts of tin and manganese appear to inhibit the growth of staphylococci, probably by stimulating antibody formation. Tin may be given orally as a tannic oxide (10 gm. daily), or in the form of the proprietary preparation stannoxyl, which is a combination of metallic tin and the oxide. Stannoxyl is also supplied in two-millilitre ampoules for intramuscular injection, and this is probably the most efficient method of administering the drug. Manganese can be taken by the mouth in the form of the chloride (5 gm. daily), but the best results are obtained by intramuscular

injection. For this purpose manganese butyrate (20 minims at intervals of five days) or colloidal manganese (0.5 cubic centimetre every third day) are the most suitable preparations. Under the heading of drugs mention must be made of yeast (*cerevisia fermentum*). Its action in correcting staphylococcal infection resembles that of nuclein, since, if injected, it increases the proportion of leucocytes after a transient leucopænia. Compressed distiller's yeast is the best preparation to employ. It is given immediately before meals in daily amounts of one tablespoonful.

THE CARBUNCLE

The origin and pathology.—A carbuncle has sometimes been described as a localized infective gangrene of the subcutaneous tissue, the result of infection by the *Staphylococcus aureus*. In some ways this is an unfortunate definition in so far as it alludes to 'gangrene'. It should be understood that the condition is essentially an infective and suppurative one, and the gangrene which ensues is entirely secondary to the infecting element. The clinical characteristics are so well appreciated that the principal features need be only outlined. The disease begins as a painful infiltration of the subcutaneous tissues and deeper layers of the skin, and the result is evident to the observer as a brawny swelling which is generally circular in outline and reasonably well defined at the periphery. The overlying skin has a characteristic dusky red hue, and there are often patches of lymph exudation upon the surface. The appearances are those of a subcutaneous infection which is extending slowly but insistently, undermining the skin, but remaining superficial to the deep fascia. Presently points of necrosis become evident in the overlying skin, and through these pus and fragments of necrotic tissue make their appearance. The skin destruction continues to extend, and, as the surface separates, a mass of sloughing and suppurative tissue is revealed. The periphery is generally indicated by a zone of increased swelling in which tissue reaction attempts to present a barrier to the further extension of the infective process. The disease may occur in any part of the body surface, but it is most frequently encountered in areas in which a thick skin of comparatively low vascularity is subject to surface irritation—the skin of the back of the neck being a frequent site. When a carbuncle develops, the intensity of the local infection is apt to be related to some general factor of a debilitating character, such as diabetes or nephritis. In other instances it is an indication of an inherent want of resistance to staphylococcal infection. While the local lesion is in process of development there are various evidences of toxæmia—pyrexia, want of appetite, and a sense of debility. The pain often becomes so intense as to interfere with sleep.

Such being an outline of the clinical picture, it is tempting to ask how the infection has been conveyed to the subcutaneous and deep skin areas. Is it a blood-borne infection, or do the organisms enter from the surface as a local invasion of the part? If the former explanation is accepted, a pre-existing septicæmia and some devitalizing influence which has localized the area of infection must be recognized. There is no convincing evidence in favour of this view. The more likely theory is that organisms are rubbed into the surface, and, having entered the superficial lymphatics, are carried into the lymph field of the cutis vera and the subcutaneous area. There they concentrate in the connective tissue which surrounds the fat lobules, and it is at this point that the infection begins. As the tension increases the fat undergoes necrosis and liquefaction, and a stage is reached which is particularly favourable to an extension of the infection. The deep fasciæ present a barrier to the downward spread, but the columnæ adiposæ encourage an upward infiltration, and it is along these deposits that the infection travels to the superficial layers of the skin and thence to the surface. The important part played by the arrangement of the fatty tissue in

the origin and extension of a carbuncle is well demonstrated in microscopic sections of the lesion.

TREATMENT OF A CARBUNCLE

The local problem.—The possibility of aborting the progress of a carbuncle is small. The infection has no structural arrangements which might limit its spread. Instead it develops in tissues of low vitality, where fascial planes favour extension, and where reactionary processes are apt to prove deficient. But if the condition comes under treatment at a sufficiently early stage, before suppuration has occurred or while it is still localized, some advantage may be gained by attempting to increase the reaction within and around the part infected. The injection of the patient's own blood (10 to 20 cubic centimetres) into the subcutaneous space at various points in the immediate neighbourhood of the infection has proved to be the way in which this response is most likely to be achieved, and under appropriate conditions it is well worth a trial. Apart from this consideration, the carbuncle is treated in its early stages by the application of heat, and dry heat in preference to moist. Nothing is better than a hot antiphlogistine pad. Some favour a hot, wet dressing, such as magnesium sulphate in glycerine (20 per cent), but any moist application is liable to lead to infection of the skin glands and hair follicles.

As soon as suppuration is evidenced by bogginess of the skin or the escape of pus on the surface, incision should be practised and free drainage established. All tension is thereby relieved and the likelihood of extension is minimized. A cruciform incision is made. The flaps are dissected from the underlying necrotic tissue and held back in an everted position by stitching the apex of each flap to the underlying skin. In this way the infected area is thrown completely open, the necrotic tissue is removed with scalpel or scissors or by endothermy, and the space is lightly packed with sterile gauze which has been soaked in a solution of acriflavine (1 in 1,000) in liquid paraffin. An outer dressing of dry sterile gauze and wool is applied and changed as often as may be required, the paraffin-flavine pack being left in place for forty-eight hours. After a few days the surface is dressed with cod-liver oil, and this is continued until granulations are plentiful and sepsis is arrested. The skin flaps are then released, and, falling back into place, they afford a covering to a considerable portion of the raw area. The subsequent dressing is a matter of individual choice: I use an antiseptic lotion, such as eusol, for a few days, and later a stimulating ointment, such as scarlet red.

Additional means of treatment.—While incision and drainage are the essentials in the treatment of a carbuncle, ancillary means may be adopted with advantage. These have already been discussed in relation to boils. At the same time it is necessary to improve the general condition of the patient—a diet of ample vitamin content is provided; fluids are given in abundance; and the patient is encouraged to live in the sunshine and fresh air.

Allusion has already been made to the association which may exist between staphylococcal infection of the skin and such constitutional disorders as diabetes and albuminuria. It is important to keep those associations in mind, for improvement in the general condition is quickly reflected as an improvement in the local error.

THE PECULIAR DANGERS OF FURUNCULOSIS ON THE FACE

This article would be incomplete without reference to the risks attendant on staphylococcal infection of the face.

The principal peripheral tributary of the cavernous sinus is the superior ophthalmic vein; it unites at the inner and upper angle of the eye with the angular vein, the supra-orbital and nasal veins and the various venous tributaries which convey the blood from the face and lips. Now, it is an unfortunate thing that these vessels are not provided with valves, and so it

happens that if infection enters any of the venous radicles of the face there is a possibility that it may be conveyed by the blood stream into the cavernous sinus. This structure has a curious formation: in order to prevent alterations in venous pressure secondary to respirations being reflected in undue degree upon the intracranial tension, it is subdivided into a number of contiguous compartments—an arrangement which results in considerable slowing of the related blood streams, and it is this relative stagnation which permits deposit of the infection and the development of a septic thrombo-phlebitis.

Can anything be done to minimize the risk? Ligature of the angular veins has been suggested, but it would be ridiculous to advise this in every case of facial furunculosis, while to apply the ligature when signs of severe thrombosis have developed, would be locking the stable door after the horse has gone, and, moreover, the anastomosis is so diffuse that no single ligature will control it. The best safeguard against the complication lies in avoiding puncture of the infected focus. Disturb the part as little as possible, apply local heat, and for the rest leave it to the natural resistance forces of the body.

Pernicious Anæmia and other Macrocytic Anæmias

By L. S. P. DAVIDSON, M.D., M.R.C.P., F.R.C.P.D.
(From the *British Medical Journal*, Vol. I, 18th April, 1936, p. 804)

It is necessary to emphasize that there are many types of macrocytic anæmia which differ widely one from another in their ætiology, response to treatment, and their blood picture, excluding the common factor of increased diameter of the erythrocyte. For convenience, however, it is possible to divide all macrocytic anæmias into two groups.

Group I contains the macrocytic anæmias which develop from a megaloblastic bone-marrow consequent on a deficiency of the factor necessary for the continuation of normal blood formation. This factor, often described as the 'specific anti-anæmic factor', is produced in the stomach as the result of the action of a gastric enzyme on food, and is absorbed from the intestine, stored in the liver, and supplied as required to the bone-marrow. Anæmias developing consequent to a deficiency of the specific anti-anæmic factor belong to the category of megalocytic anæmias.

Group II consists of those anæmias in which the macrocytosis results from causes other than a deficiency of the specific anti-anæmic factor; it is a more ill-defined and heterogeneous group of relatively rare macrocytic anæmias resulting from widely differing causes. The macrocytosis is secondary, in the majority of cases, to prolonged stimulation or irritation of the bone-marrow. Blood formation proceeds on a normal basis, but owing to its excessive activity the parent cells in the bone-marrow are normoblasts, and as a result many of their offspring entering the peripheral circulation are larger and more immature than normal erythrocytes. Macrocytic anæmias belonging to group II are present in (a) some cases of hæmolytic anæmia—for example, acholuric jaundice, sometimes of the congenital but more usually of the so-called 'acquired' type; (b) occasionally in stages of leucæmia; and (c) in the terminal disease and malignant disease, in which the bone-marrow is irritated by metastatic deposits. These macrocytic anæmias are differentiated from the true megalocytic anæmias on three main grounds: (1) the finding of the ætiological factor; (2) by full examination of the blood picture, which differs in important details in regard to red cells, white cells, and platelets; and (3) by their failure to respond to the ingestion or the injection of the specific anti-anæmic factor, and by their response to appropriate treatment (splenectomy, x-rays, etc.).

It is hoped that the preceding remarks make it clear that all megalocytic anæmias are macrocytic but that all macrocytic anæmias are not megalocytic. This paper will be restricted to the treatment of pernicious anæmia and other megalocytic anæmias.

CLASSIFICATION OF THE MEGALOCYTIC ANÆMIAS

It is obvious that a deficiency of the specific anti-anæmic factor may arise in one of three ways: (A) by a failure in its manufacture in the stomach; (B) by defective absorption; and (C) by ineffective storage, mobilization, or utilization. On this basis a simple classification of the megalocytic anæmias can be produced.

Under (A) are included (1) Addisonian pernicious anæmia and the pernicious anæmia of pregnancy. In the former the loss of the specific gastric enzyme is permanent, while in the latter it is temporary. (2) The megalocytic anæmias which result occasionally from extensive resection of the stomach or its widespread destruction by cancer. (3) The tropical macrocytic anæmias of Indian women (Wills), which arise from nutritional deficiency and not from a failure of gastric secretion.

Under (B) is included the megalocytic anæmia which occurs in many cases of tropical and non-tropical sprue, and in some cases of pellagra. In certain instances dietary deficiency and impairment of gastric secretion are factors to be considered in addition to a failure in absorption. Occasionally absorption is so seriously affected in individuals suffering from intestinal stenosis, from multiple anastomoses, and from prolonged diarrhoea as to result in a megalocytic anæmia.

Under (C) are included cases of severe liver diseases, particularly cirrhosis, in a proportion of which, estimated by various authors at from 5 to 25 per cent, a megalocytic anæmia occurs. In some of these cases cell-volume measurements show that this is really a false macrocytosis, due to a flattening of the cells produced mechanically during the spreading of the blood film. It is suggested that the physical state of the plasma in cirrhosis conduces to this effect. In other cases, however, cell-volume measurements are in agreement with cell-diameter measurements, and it is presumed that the damage to the liver prevents it from functioning efficiently as a storage organ for the specific anti-anæmic factor, thus allowing a megaloblastic blood picture to occur. In such cases the administration of the specific anti-anæmic factor, by mouth or by injection, will cure the anæmia but will not alter the underlying disease of the liver. Lastly, it has been suggested that a failure in the mobilization or utilization of the specific anti-anæmic factor arises occasionally, since in certain cases of megalocytic anæmia production and storage of the active principle has been shown to be satisfactory and yet the bone-marrow fails to respond to the naturally produced factor or to its parenteral administration. Before this group of megalocytic anæmias, called by Wilkinson the 'achrestic' anæmias, can be finally accepted and its clear demarcation from partial aplasia of the bone-marrow be fully distinguished, further studies of the bone-marrow are required.

The value of such a classification lies in the fact that all cases of megalocytic anæmia falling under (A) and (B), and some under (C), are examples of anæmias due to a specific deficiency, and as such can confidently be expected to be relieved by supplying the missing factor. Since Addisonian pernicious anæmia is the most common and the most important of the megalocytic anæmias, it will be used as the therapeutic example on which treatment of all the megalocytic anæmias can be modelled, with minor modification.

NECESSITY FOR ACCURATE DIAGNOSIS

It might appear unnecessary to emphasize the fact that treatment should be preceded by adequate diagnosis. Those of us who are accustomed to seeing large numbers of cases of anæmia realize only too well that the technical difficulties which the majority of

doctors experience in making a blood examination frequently result in treatment being instituted without this essential diagnostic procedure being undertaken. In consequence, there are large numbers of persons taking liver extract who require either no anti-anæmic remedy or only a simple iron preparation; and, vice versa, there are other individuals who reach hospital desperately ill in the severe relapse stage of pernicious anæmia, or crippled with advanced neurological disease, who have been taking iron pills for months or have received no treatment at all owing to wrong diagnosis. The last three cases of pernicious anæmia with a blood count of one million red cells or less seen by the writer had been diagnosed as inoperable cancer of the stomach; no blood examinations had been made and hence no treatment instituted.

The treatment of the anæmias with a 'shot-gun' prescription of iron and liver extract, without full investigation, is becoming increasingly common, based on the presumption that one or other of these constituents must be required. If the patient's blood condition fails to respond serious organic disease is generally responsible and a fatal delay in diagnosis may result. If the patient improves the diagnostic criteria obtained from blood examination will disappear, and after a few weeks the doctor will not be able to know which of the substances should be continued for maintenance purposes. For the adequate control of treatment regular blood examinations are essential because of the great variation which occurs not only in the potency of different anti-anæmic preparations available, but also in the individual's response to treatment. As much as five to ten times the amount of liver extract may be required in one case compared with another apparently similar in regard to age, blood level and the absence of inhibiting factors such as arterio-sclerosis or infection. Lastly, for estimating the amount and the frequency of dosage needed for the maintenance of a normal blood level no alternative to regular blood examinations is available. If these facts are accepted it is obvious that so long as such procedures are beyond the scope of the majority of the practising members of the profession, central blood clinics must be established in suitable localities for the benefit of both doctors and patients alike.

OBJECTS OF TREATMENT

The aim of treatment is (1) to restore the blood picture, qualitatively and quantitatively, to normal as quickly as possible; (2) to maintain a normal blood level; and (3) to replenish and stock adequately the depots of the body with the factors necessary for blood formation. Minot has rightly pointed out that the individual who receives only just enough of a nutritional factor, such as a vitamin or a mineral, to maintain health may be precipitated into the zone of partial deficiency with the advent of infection: hence the importance of adequate reserves.

It would appear advisable to consider the treatment of pernicious anæmia according to the stage of the disease present when the patient is first seen.

THE SEVERE RELAPSE STAGE

The patient is critically ill and in a collapsed state, with a blood count of approximately one million red cells and a hæmoglobin content of 20 to 30 per cent. Before 1926 patients were frequently seen in this terminal stage, but to-day there can be no possible excuse for allowing such a state to develop. The question of blood transfusion immediately arises: the clinical state of the patient, as judged by the degree of circulatory failure rather than by the blood level present, must be the deciding factor. If the blood pressure is very low (diastolic pressure of 55 mm. Hg or less), the pulse fast (120 or more), the heart dilated, dyspnoea present at rest, and oedema severe, it may be decided that the delay of four or five days which must elapse before improvement can occur as a result of treatment entails a risk to life which cannot be taken. In which case a blood transfusion should be given at once.

Blood transfusion.—One pint of blood from a suitable donor should be run into the recipient's vein, very slowly in order to avoid a reaction which the weakened system may be unable to tolerate. At least half an hour should be taken for the transfusion of blood. Five c.cm. of a liver extract specially prepared for intravenous injection (hepatex P.A.F.) should be added to the blood, and 5 c.cm. of an extract suitable for intramuscular injection should be injected into the gluteal region (campolon, hepatab, pernamon forte, Lilly, etc.). In less urgent cases, in which some doubt exists regarding the need for immediate transfusion, a suitable donor should be procured and arrangements made to keep in touch with him should an emergency arise. The intramuscular injection of 5 c.cm. of liver extract should be continued daily for three or four days, by which time the reticulocyte increase will have started and a marked subjective improvement will be noted. Within ten days the blood count should have risen by nearly one million red cells, and the patient should be out of all danger.

Iron.—Iron and ammonium citrate, 30 grains three times a day, or one tablet of ferrous sulphate (Glaxo 501A), twice or three times a day after food, should be started after the first week and continued for two months, in all cases receiving treatment by the parenteral route, since an iron shortage is apt to arise owing to the exceedingly rapid production of erythrocytes.

Diet.—For the first week a light fever diet should be given, owing to the impairment of gastric digestion.

Drugs.—Hydrochloric acid, combined with glycerin of pepsin, according to the following prescription, is of value if dyspepsia or diarrhoea is present.

R Acid hydrochloridi dil. .. ℥ij
Glycerini pepsini .. ℥iv

One to three teaspoonfuls to be added to a large tumbler of water flavoured with orange juice and sipped during meals.

It should be pointed out that the most efficacious treatment for all the symptoms of pernicious anaemia, and for the prevention of such serious complications as spinal cord degeneration and gall-bladder inflammation, is the adequate administration of the anti-anæmic factor. Dyspepsia, diarrhoea, sore tongue, and general weakness all rapidly disappear in the majority of cases without any symptomatic treatment.

STAGE OF MODERATE RELAPSE

The patient complains of weakness, palpitation, exhaustion, dyspepsia, and dyspnoea on effort, but there is no danger to life. The blood count may be from $1\frac{1}{2}$ to $2\frac{1}{2}$ million red cells and the hæmoglobin 40 to 60 per cent. In such a case a choice must be made between parenteral and oral treatment.

Parenteral treatment

An intramuscular injection of 5 c.cm. of a liver extract should be given on three or four consecutive days deeply into the gluteal region, alternating daily from side to side. Following the injection firm massage should be applied at the site of injection for a few minutes. By this means subsequent pain and stiffness are greatly reduced. Thereafter a weekly injection of 5 c.cm. must be given until the blood count is normal. It not infrequently happens that the blood level tends to become stationary around $3\frac{1}{2}$ to 4 million red cells and 80 to 85 per cent hæmoglobin and the patient looks and feels perfectly well. It is essential to restore the blood level completely to normal (5 million red cells and 100 per cent hæmoglobin), as this is an important factor in preventing degenerative changes in the spinal cord. It may be necessary to double or treble the number of weekly injections before normality is obtained. No special diet is required. The patient should take a plentiful, well-balanced mixed dietary, containing red meat and green vegetables in at least one meal a day. Drugs: iron and hydrochloric acid as already indicated.

Oral treatment

Liver extract by mouth was the treatment of choice till about three years ago. The extract from 500 grams of liver daily is generally needed to obtain the maximal regeneration of blood. As the cost of treatment works out at from 20s. to 30s. weekly, compared with approximately 2s. 6d. to 3s. when parenteral treatment is given, liver extract by mouth can no longer be recommended, for economic reasons. In addition, in resistant cases and in those in which absorption is poor, oral treatment does not compare with parenteral, on the grounds of efficiency. Half a pound daily of lightly cooked liver is the average dose required if liver is taken in the crude state. Since the specific anti-anæmic factor is moderately heat-stable there is no point in prescribing raw liver. There are several reasons why treatment of choice: first, there is an ever-increasing difficulty in obtaining regular and adequate supplies; secondly, the cost of liver has risen very greatly; and, thirdly, many persons fail to continue to take the requisite amount required to attain and maintain a normal blood level, owing to the nausea and disgust engendered by the constant sight, taste, and smell of the article.

Hog's stomach preparations.—These preparations are insoluble and contain the gastric enzyme, which is thermolabile; hence they must not be heated. Excellent results can be obtained from the use of such preparations as ventriculin, pepsac, ektomak, etc., in doses of a tablespoonful three times a day, in water, milk, orange juice, etc. English preparations, such as pepsac, are cheap (8s. 6d. a pound), but they have an unpleasant taste and smell, which can be improved by exposing the next day's ration in a saucer to the air for twelve hours.

General and pre-operative measures

Patients should be kept in bed until the hæmoglobin has reached approximately 60 per cent. Chronic focal sepsis (tonsils, teeth, or accessory sinuses) should not be treated radically until there has been an adequate response to specific anti-anæmic therapy. On the other hand, localized and easily accessible collections of pus should be evacuated, since they tend to inhibit or retard the therapeutic response. Should an emergency arise during the relapse stage of pernicious anaemia, requiring an operation which cannot be delayed, intensive parenteral treatment should be undertaken immediately (10 c.cm. of liver extract intramuscularly, repeated in six hours), and a suitable donor should be procured in order that blood transfusion can be immediately given if required. Patients in the remission stage of pernicious anaemia, particularly if they show signs of neurological disease, should receive double or treble the usual quantity of liver extract for a few days before undergoing any major operation, since the blood level tends to fall and neurological degeneration to progress, after serious surgical procedures.

MAINTENANCE TREATMENT

The amount of material required to maintain a normal blood level varies greatly in different individuals, often for no apparent reason. Only by trial, checked by blood examination, can the problem of dosage be satisfactorily settled. In parenteral treatment the necessary number of intramuscular injections of 5 c.cm. of liver extract varies in different individuals from one a week to one every six weeks. In my experience, 5 c.cm. of campolon, given once every two or three weeks, is an average dose. Iron is not required if it has been prescribed during the first two months of treatment. Hydrochloric acid and pepsin are necessary for the purposes already mentioned. An ordinary mixed diet is all that is required. The maintenance dose of liver and hog's stomach preparations is also extremely variable in different individuals: on the average, it may be said to be two pounds of liver or four ounces of dried hog's stomach preparation weekly.

The depot storage method of treatment, whereby 5 to 10 c.cm. of a liver extract is injected intramuscularly on two consecutive days, is of value to patients proceeding on holiday or on business to places where facilities of treatment are not available. By this method a satisfactory blood level may be maintained over periods up to two months.

In my experience parenteral treatment is the method of choice at all stages of the disease, on the grounds both of efficiency and of economy. Should the patient object to injections, however, cooked liver and hog's stomach preparations on alternate days, in the doses mentioned above, should be advised, as by this means the distaste engendered by both articles, if continuously taken over long periods, is reduced.

MEGALOCYTIC ANÆMIAS OTHER THAN ADDISONIAN ANÆMIA

The scheme of treatment outlined above is satisfactory for the treatment of the anæmia present in the other conditions mentioned, with the following modifications.

Pernicious anæmia of pregnancy

In the majority of cases treatment can be discontinued after parturition.

Tropical and non-tropical sprue and pellagra

In the above conditions multiple deficiencies are present which must be corrected. In addition to supplying the anti-anæmic factor, the deficiency of vitamins and minerals must be repaired by the administration of marmite (one teaspoonful in water or in a bread-and-butter sandwich thrice daily); radiostoleum or adexolin (5 minims thrice daily); calcium (calcium lactate, 30 grains thrice daily); and iron (as above). For the control of the fatty diarrhoea restriction of fatty foods, especially cream, butter, milk, bacon, and fatty meat, must be made. A high intake of grade A protein—for example, liver and butcher's meat—is recommended, while starchy food should be taken in small quantities only. For details the reader is referred to the literature dealing with the dietary problems in the above deficiency diseases. When the condition has been cured by diet and anti-anæmic treatment the maintenance dose of the specific anti-anæmic factor may be steadily reduced, many cases being able thereafter to maintain a normal blood level by diet alone.

With regard to the megalocytic anæmias occurring in cases of severe liver disease, the results of anti-anæmic treatment are less satisfactory, since prognosis depends on the degree and progress of liver damage. Lastly, in the so-called 'achrestic' and semi-aplastic anæmias with a megalocytic blood picture the response of the formative tissues to the treatment outlined above is absent or very poor. Repeated blood transfusion can, however, maintain the patient alive, but in a poor state of health, for long periods.

The Prevention of Cancer

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(Abstracted from the *Lancet*, Vol. I, 2nd May, 1936, p. 987)

It is quite possible that a medical or systemic cure of cancer will be discovered before the nature of the neoplastic process is fully understood, for the use of quinine and mercury, in malaria and syphilis respectively, preceded the discovery of the organisms of these diseases. On the other hand the technique of prevention of a disease would appear more closely dependent upon knowledge of its causation. The prevention of malaria waited upon that knowledge of the life-history of the malaria parasite which Laveran, Manson, and Ross supplied. I believe that a general conception of the origin of the cancer process, founded upon observed facts, can now be arrived at, however obscure the intimate nature of the process may remain. If so, the prevention of the disease can be approached in a more hopeful spirit, and my choice of subject may be justified.

THEORIES OF THE CAUSATION OF CANCER

Any theory of the causation of cancer must cover and unify an extraordinary and miscellaneous range of observed facts. The late Prof. Archibald Leitch in 1927 collected these facts together without deducing from them any theory. He pointed to Pott's observation that chimney-sweeps were especially liable to cancer of the scrotum as the first gleam of light on the origin of cancer—showing it to be a disease of local and not of constitutional origin. Pott noted that the disease slowly and imperceptibly evolved from a simple wart resulting from prolonged contact of soot with the skin. It was Leitch himself who showed that the soot did not act mechanically, and that its admixture with the sebaceous secretion of the scrotum was necessary to activate it. The fatty secretion dissolved out of the soot some active cancerogenic agent in minute quantity.

In 1771 Volkmann described cancer of the anus and scrotum in workmen employed in lignite distillation plants and due to the crude distillates of tar or paraffin. Some years ago Alexander Scott described the cancers occurring in Scotland in workmen exposed to shale-distillation products. Crude petroleum and some refined oils also have been found to cause cancer. A. H. Southam and S. R. Wilson found that cotton spinners, exposed to a spray of mineral oil from the spindles, suffer from cancer of the scrotum. Workers in hot tar are liable to cancer on the exposed forearms and also on the scrotum. The chewing of betel-nut mixed with lime often produces cancer inside the cheek and upon the gums.

Reviewing such facts as these there is little cause for surprise if the inference was drawn that cancer is due to direct local chemical irritation of the epithelium. Soon however it appeared that physical irritants might be substituted for chemical irritants without any alteration in the final result. Theodore Maxwell in Kashmir noted that repeated burns of the skin, resulting from the wearing under the robes of the kangri basket containing hot charcoal, might eventually lead to cancer. Twelve years after the discovery of x-rays the first x-ray cancer was evolved. Prolonged exposure to radium produced the same result. G. M. Findlay has produced papilloma and carcinoma in white rats by exposing the ear to ultra-violet light. Rodent ulcer and epithelioma of the skin are especially frequent in Queensland where a white race unprotected by pigment is exposed to a tropical sun.

The radiation cancers were brought under the fold of the irritation theory of cancer by a simple expedient. It was admitted that the irritation might be chemical or physical.

Arsenic and aniline cancer

About 1887 Jonathan Hutchinson drew attention to a form of cancer arising in patches of psoriasis in patients who had taken arsenic therapeutically for long periods. The same thing occurs in arsenic workers in Styria, and Leitch observed cases in men engaged in the manufacture of sheep-dip and weed killer. In arsenic cancers the metal inhaled or swallowed is excreted by the skin, and the growths may be widespread and multiple. Workers in aniline dyes are subject to cancer of the bladder, probably owing to the excretion of ingested dye-products in the urine.

There was no difficulty in applying the irritation theory to cases where the irritant acted during its excretion upon the excretory organs. Certain difficulties however showed themselves, particularly the fact that the cancer might show itself many years after the patient's last contact with the irritant, and that some violent irritants such as mustard oil have no cancer-producing power. It became necessary to define an irritant as any substance or agent which can induce cancer. It thus became clearer than ever that cancer is due to chronic irritation.

Lupus and syphilis cancer

Many years after an area of lupus has completely healed, and apart from any therapeutic treatment, it

may become the seat of squamous-celled carcinoma. A tongue which has suffered from mucous tubercles and syphilitic glossitis in the secondary stage of syphilis is likely in later life to be affected by chronic glossitis and epithelioma. The irritation theory was accordingly modified by including certain bacteria in the list of cancer-producing irritants, and later certain parasitic worms were added to it, following Fibiger's discovery that cancer could be produced in underfed rats by feeding them with cockroaches infected with gongylonema, a minute parasitic worm. The ova of ankylostoma duodenale* invading the mucosa of the bladder were found to cause cancer of that organ. Peyton Rous and W. E. Gye found that a filter-passing virus was the cause of sarcoma in fowls. J. B. Murphy, of the Rockefeller Institute, maintained that the supposed virus was of the nature of a ferment. Recently a virus has been incriminated by R. E. Shope as the cause of an infective papilloma in rabbits which may become malignant, but this is the only instance in mammals where substantial evidence for a virus as a possible cancer agent has been produced.

Lymph stasis and cancer

In such a tangle of miscellaneous causes it is fair to assume that links in the chain of causation are missing, and that as the final result—cancer—is approached unity of causation might be detected. I believe that in lymph stasis and its physiological consequences I have found the single immediate cause of cancer. All the various cancerogenic agents have, I believe, this quality in common, that they can produce lymphangitis and consequent lymphatic obstruction. I have been able to demonstrate the presence of lymphatic obliteration and consequent lymph stasis in precancerous areas due to the ravages of syphilis, tubercle, x-rays, or radium, or resulting from the chronic lymph stasis of chronic mastitis. No single organism or virus is specifically and exclusively associated with the production of cancer. Any physical or chemical agent, any organism or mixture of organisms, able to cause lymphangitis, may set going a process which in ten, twenty, or forty years may eventuate in malignancy.

THE PATHOLOGY OF LUPUS CANCER

For the sake of brevity I desire to concentrate attention upon one particular form of cancer, lupus cancer, in which the stages of the process which leads to cancer are easily demonstrable. I would first insist that tubercle bacilli may have disappeared for many years from the original area of lupus before cancer appears in it. A sound scar with a few papillomata upon it may be the only residue of the original disease. The epithelium appears healthy and there is nothing to indicate that the tuberculous poison has produced any change in it. In the early stage of lupus, the stage of active extension and ulceration, before repair has begun, the epithelium seems entirely passive. It quietly disappears as the lupus nodules undermine it. When repair begins the epithelium spreads over the new granulation tissue in a normal way. Sometimes the lupus process is not intense enough to cause ulceration. It then gives rise to papillomatous elevations of the skin. A section through the growing edge of such an area of papillary lupus—a section taken outside its visible margin—shows with crystal clearness not only the nature of the lupoid process, but also the nature and mode of origin of papilloma. Just as a lacteal is the central structure of an intestinal villus, a capillary lymphatic end-sac is the central structure of a villus of the skin. It can be seen that over a zone about $\frac{1}{4}$ inch wide outside the apparent edge of the lupus area the papillary lymphatics are blocked by proliferation of their endothelium.

Evidently lupus is essentially a tuberculous lymphangitis of the skin lymphatics. Furthermore it can be seen that the blocking of the central lymphatic has

upset the hydrostatic arrangements of the papilla. The tissue fluid can no longer flow freely out of it and the papilla begins to swell and to elongate. From the edge of the specimen back towards the centre of the lupus area a gradual elongation of the skin papillae up to ten times their normal length can be traced. Their connective tissue receives from this lymph congestion a powerful stimulus to proliferation in which at a later date the epithelium shares. How powerful is the nutritive stimulus of lymphatic obstruction upon the tissues subjected to it is well seen on a large scale in the huge legs of elephantiasis. Wherever a papilloma is found it may be presumed, and it can frequently be demonstrated, that this process of obliterative lymphangitis has previously affected the lymphatics of the papilla. It is a fact of the highest significance that nearly every form of cancer affecting squamous-celled, transitional or columnar-celled surfaces is preceded by papilloma. In the case of glandular mucous membranes such as that of the stomach, cancer is preceded by adenoma, which is also a manifestation of lymphatic obstruction. The close and almost universal association of papilloma and adenoma with cancer shows in my opinion that lymphatic obstruction is a precursor of cancer which may fairly be described as its cause.

It is easy to understand how the physical stimuli which cause cancer are able to cause lymphangitis and lymphatic obstruction. In x-ray dermatitis the obliteration of some lymphatics and the dilatation of others are easy to demonstrate. But at first sight tar-cancer seems to be a difficulty. Here the tar is applied directly to the epithelium which subsequently becomes cancerous and direct irritation seems proved. But Ludwig Kreyberg has studied the changes in the mouse, produced by tar-painting, and has shown that the initial change is an infiltration of the subepithelial tissues by polymorphic leucocytes. The primary response to tar-painting occurs in the connective tissue and its appearances are those of an acute lymphangitis.

Chronic mastitis

A study of the physiology of the breast shows that nature's method of inducing proliferation is to pour out an excess of lymph into the tissue interspaces, and provides further evidence of the important part played by lymph stasis in physiology and in the genesis of cancer. The recurrent monthly physiological lymph stasis which occurs in the breast temporarily stimulates the proliferation of all its tissues. If lymphatic return from the breast is hindered by local areas of lymph obstruction, probably due in most cases to casual and unnoticed infections of one or more breast-ducts where they open upon the nipple, the stimulus of lymph congestion instead of being periodic becomes permanent. The lobe whose duct has thus been infected is unable to empty itself of lymph, and receives a permanent stimulus to proliferation. The lymphatics are blocked by proliferation of their own endothelium. The ducts are surrounded by a sheath of adventitious fibrous tissue due to proliferation and blocking of the periductal lymphatics. Papillomata appear within them as the nutritional stimulus begins to affect the epithelium, and finally carcinoma may supervene.

It is the fashion to ascribe the various diseases which affect the breast to endocrine disorders, and there is of course no doubt that the breast is under endocrine government. But morbid conditions such as chronic mastitis affecting single and separate lobes of the breast, and sparing other lobes of the same breast, cannot be accounted for by general endocrine influence. A local factor must be present, and that local factor is permanent lymph stasis. The various steps which lead from lymph stasis through chronic mastitis to cancer may be easily demonstrated histologically. Space forbids me to discuss other forms of carcinoma or to discuss congenital moles in which developmental defects of the lymphatic system lead to local areas of lymphatic obstruction and papillomatous hypertrophy, and sometimes to carcinoma or sarcoma.

*This is apparently a misprint for *Schistosoma hæmatobium*.

PREVENTION IN THE LIGHT OF ÆTIOLOGY

If the lymph-stasis theory of cancer is valid the simple recipe for the prevention of cancer is to maintain the lymphatic circulation throughout the body in a state of high activity. If, as is often stated, though without conclusive evidence, cancer is relatively infrequent in wild animals, this may well be due to the superior vigour of their lymphatic circulation, the result of an active life. Even in local areas of lymph stasis a sufficient minimum flow may thus be secured to avert a threatened carcinoma. Civilized man may well take the hint, remembering that as E. H. Starling showed a resting limb produces hardly any lymph. Civilized man is apt to overstrain his glandular mechanisms, especially those of digestion, while at the same time he allows his muscles to fall into disuse. Glandular secretion increases the production of lymph without doing anything to promote the lymphatic circulation. Muscular exercise on the contrary brings into play all the forces which maintain the lymphatic circulation—the pulsation of adjoining arteries, the massage action of muscular contraction and of bodily movements, and the aspiration effects of deep respiration. Thus regular exercise and moderation in eating are likely to stave off cancer, but a heavier stress must be laid on the avoidance of infections and their prompt treatment, for the small local areas of lymph block in which cancer arises are most often due to bacterial infections, severe or slight. In this connection dental infection requires special stress, for as F. St. J. Steadman showed, cancer of a dentally clean mouth is a rarity.

Prevention of cancer in precancerous areas

Sometimes the best method of dealing with precancerous areas is to excise them. The enlarging mole, or the papillomatous area in chronic glossitis, may thus be dealt with. But the method is sometimes impossible and never popular.

Irradiation of precancerous areas.—It would appear quite feasible to administer to precancerous areas a sufficient dose of radiation to depress the activity of the potentially cancerous epithelium. In this connection I will only refer to one variety of cancer, and give *prima facie* evidence that a short course of deep x-rays will avert cancer in precancerous breasts.

I may remind you that in the year 1900 at the Pathological Society of London the late F. T. Paul of this city first drew attention to the association between chronic mastitis and tumour formation. Though the question continues to arouse controversy there is in my mind no doubt of the intimate connection between chronic mastitis and subsequent cancer.

In 1910 I advocated the x-ray treatment of chronic mastitis, which has since been widely adopted. The sector-shaped indurations of chronic mastitis frequently soften or disappear after three half-pastel doses of x-rays. At that early period the modern hard x-ray was unknown, and among several hundred cases of chronic mastitis treated in this way several developed cancer. Of late years I have continued to use the method, but have advised the high potential short wave x-ray of 180,000 volts. Several hundred cases have been treated for me in this way by Dr. Russell Reynolds, Dr. Douglas Webster, and other radiologists, and in no single case has cancer supervened in the breast treated. When a breast has suffered from chronic mastitis and cancer, the other breast is likely in the course of years to follow the same course. I will give an instance.

Five years ago I operated upon a nurse with cancer of the right breast. Three years ago I found a mastitic thickening in the other breast and urged either mastectomy or x-ray treatment for this breast. The patient rejected my advice, and was only seen again recently, when she had a hopeless carcinoma originating in the mastitic area of the remaining breast—not a recurrence but a second primary growth.

Many cases could be adduced tending to show the preventive action of x-rays upon precancerous breasts. The problem is one of great importance, and could be

definitely settled if 1,000 women would permit one breast to be irradiated at the age of forty, the other breast remaining untreated as a control. A complete follow-up in each case would of course be necessary. A preventive course of x-rays to both breasts is at any rate harmless, and should certainly be given when the breast has done its work to all women with a strong family history of cancer, or suffering from chronic mastitis.

Penile cancer: preputiomy

Carcinoma of the penis is not a common, but not a very rare form of the disease. At the Mayo Clinic 195 cases were seen from 1907 to 1932; about one case in every 300 of male cancer. The institution of circumcision has provided for the Jews complete protection against penile carcinoma. The origin of the operation is lost in the mists of antiquity but it was practised by the Egyptians of the predynastic era, and the oldest known mummy, that of Ra-Nefer in the R. C. S. Museum, presents evidence of circumcision. A simpler operation would produce the same protective result. If the dorsum of the prepuce is slit up as far as the glans, and a stitch if necessary inserted at the upper end of the incision, within a few years' time, owing to the gradual retraction of the lateral flaps of the prepuce, the result will be indistinguishable from that of circumcision. If performed just after birth the little operation can be done without an anæsthetic.

In phimosis a delicate mucous membrane is exposed for life to the attack of a mixed bacterial flora living under complete shelter, and also to the chemical action of decomposing secretions. Recurrent attacks of lymphangitis of the glans, and the resulting lymphatic stasis, provide the basis for papilloma and cancer. S. K. Ngai, in reporting on 107 cases of carcinoma of the penis in China, found that of 88 patients who made a positive statement on the matter 87 had had phimosis. Carcinoma of the penis is frequent among Chinese farmers and coolies, rare in the educated classes. That the Jewish immunity is not racial is indicated by Wolbarst's case occurring in an uncircumcised Jew, while there is no case in the literature occurring in a circumcised Jew.

Phimosis and uterine carcinoma

There is evidence that the existence of phimosis, or in its absence carelessness as to subpreputial hygiene and cleanliness, is a menace even more serious to the female sex than to the sex in which they originate. Briefly stated the evidence is this, that though certain forms of cancer—of the liver, the breast, and the rectum for instance—affect Jews more frequently than non-Jews, Jewish women show a much smaller liability to carcinoma of the cervix. In Amsterdam the non-Jewish inhabitants were found by Hoffman to show an incidence to cervix cancer of ten per 100,000, while the corresponding figure for Jewish women was less than four.

Cancer in Amsterdam, 1919–29 (Hoffman)

Catholics.			Jews.			Catholics.			Jews.		
(per 100,000)						(per 100,000)					
Stomach	..	47.9	32.9	Breast	..	9.32	11.3				
Liver and gall-bladder	..	13.21	17.16	Œsophagus	..	9.51	3.63				
Intestines	..	12.66	9.49	Rectum	..	6.48	8.37				
Uterus	..	10.19	3.6	Lung	..	2.66	3.39				

Maurice Sorsby comments on the relative freedom of Jewish women from cancer of the uterus. Vineberg, in the outpatient department of the Mount Sinai Hospital of New York, observed among 19,000 patients, of whom 95 per cent were Jewish, only 18 cases of uterine cancer and nine of these were in non-Jewish women. Thus the incidence among the Jewish women was only one-eighteenth of that among non-Jewish. Two other investigations by Rubin at the same hospital for other years gave incidence ratios of 1 to 7½ and 1 to 15 for Jews and non-Jews. Similar evidence is quoted by

Sorsby from the Mayo Clinic. In every thousand non-Jewish patients seen at the Mayo Clinic six have carcinoma of the cervix; in every thousand Jewish patients only one has carcinoma of the cervix. Similar evidence is quoted by Sorsby from Paris, Budapest, Munich, Amsterdam, and Montreal. He concludes: 'All the available evidence is therefore unanimous in pointing to a definitely lower incidence of uterine cancer among Jewish women'. He believes that the hygienic ritual imposed on women by the Mosaic law accounts for their immunity, but the explanation seems unconvincing. The cervix exists normally under the same optimal conditions for bacterial life which are found under the phimotic prepuce. It is not surprising if marital infection with the subpreputial flora may lead to cervical cancer in the course of twenty or thirty years, just as in the male it leads to penile cancer. Immunity to penile carcinoma and partial immunity to cervix cancer are not constitutional peculiarities of the Jewish race. There is another race which enjoys the same privileges, and that race also practises circumcision.

During a brief visit to Fiji in 1927, my attention was drawn to the occurrence of penile cancer in the Indian inhabitants originally imported from India, and to its absence among the aboriginal Fijians. The two races live side by side without mixing and the islands contain about 90,000 Fijians and 70,000 Indians. The Fijians, but not the Indians, practise circumcision at puberty. I endeavoured to find out the relative liability of the women of the two races to cervix cancer.

A search through the careful reports of the Colonial War Memorial Hospital at Suva, Fiji, shows that during the eight years, 1925-32 inclusive, three cases of cervical carcinoma in Fijians were admitted, and 26 cases in Indian women. Thus the smaller of the two population groups, the one not practising circumcision, shows an incidence of cervix cancer upon its women more than eight times greater than the incidence of the disease upon women of the other or circumcised nation. The total number of hospital cases of malignant disease of all kinds in Indians was 97 as compared with 61 in Fijians.

The freedom of the Fijian race from cervix cancer is therefore not due to any racial immunity to cancer, nor can it be explained as illusory and due to reluctance to seek hospital treatment. It must be attributed to the protection which the hygienic operation of circumcision affords against mixed bacterial infections of the cervix during coition. It is customary to ascribe cervix cancer to trauma of the cervix during parturition, but if this were the case both races should be affected equally.

Puerperal sepsis and the male

If chronic mixed infections are mainly responsible for cervical carcinoma, it is pertinent to inquire whether the obstinate persistence of high puerperal mortality, in spite of the vigorous campaign directed against it by our health authorities, may have a similar origin. The maternal death rate per 1,000 live and stillbirths, which in 1928 was 1.72, actually rose in 1933 to 1.75. The rise, otherwise difficult to explain in this aseptic era, is intelligible if, as I suggest, an important aetiological factor has been ignored. Educational insistence on strict personal hygiene for the man would be slow and uncertain in its action. Insistence on universal preputiotomy might very well prove to be a controlling factor for this particularly cruel and obstinate scourge of national life.

In a discussion on puerperal blood infections at the Fifth British Congress of Obstetrics and Gynaecology, held in London in 1925, the late Prof. W. Blair-Bell expressed the view that coitus shortly before parturition might be an important factor in puerperal sepsis. In 20 per cent of lying-in patients who gave a history of recent coitus, hæmolytic streptococci were found in the vagina.

I have endeavoured to obtain evidence of the relative incidence of puerperal pyrexia in Jewish and non-Jewish women. The Ministry of Health were unable to find

for me any study of the subject. It urgently needs investigation. The relations of phimosis to puerperal sepsis should also be studied.

The subject has reached a stage when authoritative advice upon it should be given by the Ministry of Health, or by such a responsible body as the British Empire Cancer Campaign. The question which King Edward VII asked about tubercle, 'If preventable, why not prevented?' is equally pertinent to the forms of carcinoma we have just considered.

Dental hygiene

The British Dental Association urges that dental benefit should be made a covenanted benefit under the National Health Insurance Act. The governing body of the British Medical Association resolved in 1928 that 'the establishment of periodical medical and dental examinations of all persons insured under the National Health Insurance Acts is urgently called for as an economic proposition, having regard to the return so to be obtained in health and productive efficiency'. But examination without treatment is not enough. The task that must be imposed on the dental profession is to maintain the oral hygiene of eighteen million insured workers and their dependants, a total of about forty million persons, most of whom at present receive no attention beyond occasional dental extraction. At a reasonable estimate this means forty million hours' work a year, or eight hours additional work each week-day throughout the year for every person on the Dental Register. The financial aspects of the question are no less alarming, for even at a capitation fee of 12s. 6d. per annum, the lower of two figures suggested by the British Dental Association, the cost would be twenty-five million pounds a year.

It is clear that the scheme can only be introduced by degrees, and that it must be accompanied by a large increase in the numbers of the dental profession, unless some of the work is delegated under supervision to partially trained persons, a plan which has been successfully adopted in New Zealand with the approval of the local dental profession. It is equally clear that self-help must be invoked. A weekly voluntary contribution of twopenne from each beneficiary, to which Parliament or the approved society might be asked to add another penny, would launch the scheme, and it would gradually grow as the people came to realize its advantages.

Until dental hygiene is secured there is little hope for any further diminution in cancer of the mouth, tongue, pharynx, œsophagus, and stomach, and gastric and duodenal ulcers will continue to wreck many lives.

A PRACTICAL PROGRAMME

Let me now sum up my simple practical programme for the prevention of cancer: Preputiotomy on all male infants at birth for the abolition of penile cancer, the diminution of cancer of the cervix in women to one-sixth of its present incidence, and a probable incidental lowering of puerperal mortality. Instruction of men in the importance of personal hygiene. A short prophylactic course of deep x-rays to the breasts in all cases of chronic mastitis, especially if cystic, for the prevention of breast cancer. Dental treatment of the people on a national basis for the prevention of cancer of the mouth and alimentary canal.

Chronic Suppurative Otitis Media: Its Operative Treatment

By M. R. SHERIDAN, M.B., F.R.C.S.ED., D.L.O.

(From the *British Medical Journal*, Vol. I, 18th April, 1936, p. 791)

A vast number of mastoid operations for chronic suppurative otitis media performed with the threefold purpose of removing dangerous disease, preserving the hearing, and healing the ear achieve their object. A proportion of these operations fail in part, and patients are disgruntled to find that their ears flow as before.

I have examined a number of radical mastoid and modified radical mastoid cavities from various sources to try to fathom the causes of failure and thus evolve a technique which would avoid them.

RADICAL MASTOID OPERATION

The observations arrived at after the study of a series of cases are enumerated below. There follows a description of a method of operating which gives a high proportion of dry ears.

1. Many incisions were too short and incorrectly curved. Insufficient exposure hampers good surgery.
2. The bony meatus in some cases was so narrow that proper supervision of the operation cavity must have been impossible.
3. The antrum remained as a recess in the hindmost part of the cavity, filled with granulations, and not epithelialized, in certain cases.
4. Occasionally the bridge had been removed too timidly. Its piers remained untrimmed, leaving the aditus as a gutter between them; over such a surface healing could not possibly take place.
5. In some a prominent facial ridge remained, damming pus and granulations in the mastoid cavity behind it.
6. The existence of a Eustachian fistula spoiled a large number of well-performed radical operations.
7. A high elevation on the bony meatal floor left a hypotympanic trough, difficult to reach in the after-treatment in some of the cases.
8. Stenosis of some of the cavities had occurred due to webs or funnel formation. In the narrow depths of the cavity discharge poured from the mouth of the Eustachian tube.
9. A stitch in one case prevented healing till removed.
10. An island of bare bone existed in a few cases because granulations had failed to spring from it. A completely flat bed of granulations greatly enhances subsequent epithelialization.

TECHNIQUE OF OPERATION

The incision is prolonged downwards and forwards to the anterior aspect of the tip of the mastoid process. Then, when the membranous meatus is entirely detached, the whole auricle can be turned forwards by the retractor and the bony meatus wholly exposed with the mastoid process.

Many surgeons are at pains to open merely the antrum, and avoid, so far as possible, gouging the rest of the mastoid process. I believe this to be a mistake. If this method is followed the posterior meatal wall must be removed obliquely from behind forwards and inwards. The antrum then forms a posterior recess, and a narrow bony meatus remains. Superior results are obtained if the bone is hollowed out extensively, almost as low as the tip and as deep as the floor of the bony meatus. The whole of the posterior meatal wall is removed entirely, so that no facial ridge remains. Before the removal of the posterior meatal wall has been completed a flap is cut. Ballance's and Korner's flaps are admirable. The latter has the advantage that a small skin flap may be cut, but a larger piece of cartilage removed. The conchal opening then slopes directly into the posterior reach of the cavity. It is quite large, but not unpleasantly obtrusive.

The field is now clear for completing the removal of the posterior wall of the meatus and the bridge. Shavings of bone are removed from below upwards, parallel with the facial canal, so that were the canal opened it would be recognized with its nerve intact. This method is more sure than relying upon the anæsthetist to watch the face. Between the elevation on the meatal floor and the lateral semicircular canal a slight ridge is unavoidably left, because here the nerve lies close beneath.

To avoid exposing the lateral sinus or dura of the middle fossa is a counsel of perfection. Many good surgeons try to follow it, and often fail. Such exposure appears to be of small consequence provided the dura

is not damaged. Uncovered dura is resistant to infection, which, in chronic suppurative otitis media, is of low virulence; proof of this is indicated by the healing of most radical incisions by first intention. It is certainly preferable to expose the dura rather than leave a plate of bone so slender that its vitality is in question. Organisms may penetrate it and thrive beneath, with the formation of an extradural or cerebral abscess. Granulations may fail to spring from it, and thus interfere with subsequent healing. If a tiny area of dura is exposed it is safer to prise up or gouge off its thin-shelled border of inner table. Here I may mention that I believe the use of burrs on the bone, and the application of bismuth-iodoform-paraffin paste, either of which blocks the crevices of the bone, and failure to gouge such fresh surfaces of bone as the meatal floor, may similarly be the causes of islets of bone failing to granulate and heal.

The remnant spike of outer epitympanic wall must be carefully gouged off. The elevation on the meatal floor should be lowered as a routine. This makes for easy access to the tympanum in after-treatment. Light curettage of the tympanic annulus and the remaining portion of the tympanum is necessary to get rid of any osteitis. Quite often a shallow osteitis here accounts entirely for the pathology of chronic suppuration, and has been sufficient to defy all efforts at consecutive treatment. The hypotympanic area can be safely curetted. In sclerosed mastoids cells are non-existent here. With regard to the vexed question of curetting the Eustachian tube, I have not found that healing is more frequently assumed by doing this. Naturally, in common with the rest of the tympanum, the orifice and commencement of the tube will be carefully curetted with a spoon. I do not believe in the existence of peritubal cells when the mastoid elsewhere is acellular.

Any of the faults in technique described may prevent healing. A Eustachian fistula is a natural sequel, and the tube is wrongly blamed. Apart from this, however, a fistula may exist after a carefully performed radical operation, and is the chief bugbear of the operation. Most bleeding points are dry when the artery forceps are removed, but a vessel in the flap usually requires ligature. Chromic gut should be avoided.

AFTER-TREATMENT

Aural surgeons differ in the after-treatment of mastoid cavities, some relying on cleansing with or without drops or powder, others packing with dry or medicated gauze. I have often observed that when at last the granulations have formed a pale, even, flat bed epithelialization very rapidly follows. Exuberant granulations delay or prevent the process. Anything that would be mildly astringent and absorb moisture should prepare quickly a favourable bed of granulation tissue and thus hasten the process of healing. It should be soluble in the ear secretion, otherwise it will clog the cavity. Boric acid fulfils these requirements. A satisfactory routine is as follows:

After operation the cavity is packed lightly and completely with dry iodoform half-inch ribbon gauze. This is removed in five or six days. Thereafter plain half-inch ribbon gauze, shaken out of sifted boric acid powder, is packed evenly throughout the cavity. This is repeated daily. Eventually, when there is little secretion and the lining is flat, simple mopping followed by insufflating a thin film of powder is all that is required.

MODIFIED RADICAL OPERATIONS

Modified radical operations are performed to remove localized disease and preserve the good hearing present. Such disease is usually located in either or all of the following sites: the postero-superior margin of the tympanic annulus, the attic, the aditus, and the antrum.

I am convinced that there is only one operation worth considering. I refer to that type which differs from a radical operation only in so far that the remains of the tympanic membrane, together with the malleus and incus, are left in position. The bridge and outer attic wall must be removed. A very large proportion

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of these cases heal and dry with full preservation of hearing. It is a great mistake to remove the incus, as this seriously curtails the hearing. If the hearing is good the incus may be presumed to be quite healthy, or only slightly diseased. Slight disease consists merely in loss of small parts of its substance, and is in no way comparable to the gross osteitis which may exist, for instance, in the outer wall of the aditus or epitympanum. If, therefore, these parts be removed the incus will become buried in healthy granulations, and will heal over satisfactorily.

If it be argued that the pre-operative hearing was poor, or that the incus was found to be grossly diseased and its removal justifiable, then a full radical operation should be carried out, as poor hearing is very seldom made worse by this procedure. It is essential to remove the bridge and outer attic wall, which are frequently

diseased and, furthermore, act as a barrier to drainage and epithelialization, which can only occur when the underlying areas are thrown open to healthy granulation tissue. No advantage is sacrificed by removing the hudge, but a wet ear is the common penalty of leaving it.

The soundness of these principles is fully borne out by observing and comparing the results of various types of modified radical operations. Extracting the incus, or leaving the bridge, dissatisfies the patient by reducing hearing or failing to stop the discharge. In that type of conservative operation which I have described as being highly successful, this is only the case if the various pitfalls in technique described in the radical operation are as carefully avoided in this one. The after-treatment should be the same, and care should be taken to avoid damaging the drum membrane.

Reviews

THE MEDICAL ANNUAL: A YEAR BOOK OF TREATMENT AND PRACTITIONER'S INDEX.—
Edited by H. L. Tidy, M.A., M.D. (Oxon.), F.R.C.P.,
and A. R. Short, M.D., B.S., B.Sc., F.R.C.S. Fifty-
fourth Year. 1936. John Wright and Sons,
Limited, Bristol. Pp. xciv plus 618. Illustrated.
Price, 20s.

WHEREAS a textbook is written primarily for the undergraduate student, the 'year book' is intended for the use of the practising physician (or surgeon), a more discriminating student. The textbook of to-morrow is written from the year books of to-day and yesterday, so that the latter form an essential complement to his textbooks for the physician who wishes to justify his claim that he is a practitioner of modern scientific medicine. Amongst medical year books in the English language, the *Medical Annual* undoubtedly holds the first place.

The year 1936 does not seem to have been marked by any outstanding medical discovery, but in each branch of the science advances have been made. Dietetics is a subject that is now receiving some of the attention that it undoubtedly deserves; hitherto it was a field that the faddist had been allowed to monopolize, and the present danger is that it will pass into the hands of the purveyor of patent foods. Some pages are devoted to this important subject under several headings, e.g., dietetics and vitamins.

More figures are given for the relative values of surgical and medical treatment of peptic ulcer, and there is a short reference to the comparatively new histidine treatment. There are obvious advantages in this form of treatment, if its value can be established, but recent work seems to have thrown some doubt on this question.

In mandelic acid a short cut to the treatment of urinary infections has been provided. The ketogenic diet, introduced a few years ago, has had its advocates and its traducers; at its best it was not a popular diet and was difficult to enforce. Mandelic acid has an antiseptic action equal to that of β -oxybutyric acid, it is excreted unchanged in the urine, and unlike oxybutyric acid, it can be administered by the mouth. It is given in doses of 12 grammes daily with sodium bicarbonate, but at the same time the urine must be kept acid, if necessary, by giving acid ammonium phosphate.

There is a two-page note on mushroom poisoning. This note is a little outside the usual scope of the book, but is useful, as it gives a classification of the symptomatology. The note gives no help in indicating how the toxic species are to be avoided, or the treatment to be applied.

For those on the look out for new instruments and new methods of examination, the cysto-diaphanoscope displays considerable mechanical ingenuity and should

be of considerable practical value in transillumination of the bladder to investigate the nature of the contents of the abdominal cavity.

The tropical disease sections have been done by Sir Leonard Rogers as in previous years. All important advances have been recorded and as usual considerable emphasis has been laid on the work done in India. We learn from a private source that Sir Leonard is giving up this work and that this is his last contribution to the *Medical Annual*. Indian readers in particular will miss his contributions.

We feel certain that the *Medical Annual* this year will again prove itself an invaluable aid to the practitioner, and that, to those that purchase it, it will be their most constant friend and companion until the next year's volume is issued.

L. E. N.

INTRODUCTION TO HUMAN PARASITOLOGY.—By
A. C. Chandler, M.S., Ph.D. Fifth Edition. - 1936.
John Wiley and Sons, Inc., New York, and Chapman
and Hall, Limited, London. Pp. xv plus 661.
Illustrated. Price, 25s.

THE fifth edition of this book has become necessary for in the last six years, since the appearance of the fourth edition, many important advances in our knowledge have been made, so that a book six years old is very out of date.

This means that the book is gradually increasing in size; this is inevitable, but in the present instance the increase is remarkably small, considering the amount of fresh matter that has of necessity been added. The relatively small increase is due to the fact that the author has the happy faculty of condensing essentials in a very clear manner.

Nowadays a book on general parasitology is rare because, on account of the growth of the three great branches, protozoology, helminthology and entomology, it is usual for a specialist in a single branch to write a textbook thereon. The book under review combines the three in a remarkably small space and in addition there is a brief outline of symptoms and treatment of the diseases directly or indirectly caused by the various parasites. Another point that favourably impresses the reviewer is that the author who is a specialist in helminthology has not devoted undue space to this branch at the expense of the other two, but he has apportioned an appropriate amount of space to all three.

The illustrations are numerous and carefully selected so as to assist in clarifying the text, and the printing and binding are excellent.

To sum up our opinion, we consider this the best modern book on human parasitology with which we are acquainted, and its perusal has been a real pleasure,

which was not marred by encountering any striking errors.

P. A. M.

THE DIAGNOSIS AND TREATMENT OF DISEASES OF THE PERIPHERAL ARTERIES.—By S. S. Samuels, A.M., M.D. (Oxford Medical Publication.) 1936. Oxford University Press, New York. Pp. xv plus 260. Illustrated. Price, 12s. 6d.

WITHIN recent years serious attempts have been made to classify and differentiate the various forms of peripheral arterial disease and to clarify the confusion that existed in regard to the terminology and pathology of these conditions. In accordance with the opinions of modern workers, Dr. Samuels has given a simple classification: there are two main forms of peripheral arterial disturbance—(1) organic obstructive diseases including thrombo-angiitis obliterans and arteriosclerosis obliterans and (2) vasomotor imbalance comprising conditions such as Raynaud's disease and erythromelalgia.

The author begins with the symptoms and signs of occlusive arterial diseases in the extremities and then devotes a chapter to oscillometry with practical hints and illustrations. The oscillometer has been preferred to the palpating finger in the examinations of the peripheral arterial pulsations. Next, he has devoted about 150 pages on thrombo-angiitis obliterans with case reports. This is followed by chapters on arteriosclerosis, Raynaud's disease, erythromelalgia and essential thrombophilia. The last-mentioned condition, also known as thrombosing disease, is a new syndrome and is characterized by sudden widespread thrombosis of major arteries and veins of previously healthy subjects. Lastly, the medico-legal aspects of peripheral arterial disease have been briefly discussed.

The author has laid stress upon the minute details of treatment especially in connection with thrombo-angiitis obliterans, but six pages to emphasize that smoking is distinctly harmful in peripheral arterial disease appear to be too much for a small monograph, while the relation of tobacco to the disease remains unproved. Paravertebral injection of alcohol as a possible alternative to sympathectomy in the treatment of Raynaud's disease has not been mentioned, probably because it is not so successful. On the whole, the book is good, the physicians will find in it a clear exposition of modern and reasonable views regarding the aetiology of peripheral arterial diseases and a valuable guide to the treatment of such conditions.

The book is written in an easy style, is well printed and has good illustrations. There is a bibliography at the end of each subject or a part of it.

R. C.

MEYER'S NORMAL HISTOLOGY AND HISTOGENESIS OF THE HUMAN TEETH AND ASSOCIATED PARTS.—Translated and edited by H. R. Churchill, Tandarts (Utrecht), D.D.S. (George Town Univ.), Dr. Med. Dent. (Rostock). 1935. J. B. Lippincott Company, Philadelphia and London. Pp. viii plus 305, with 324 illustrations of which 26 are in colour. Price, 20s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 15

THIS is an excellent monograph on the histology and development of teeth, translated from the original German textbook and has been written specially to meet the needs of the curriculum in dentistry recommended by the American Association of Dental Schools. The book is admirable in print, in illustration and in substance. The introduction of 324 diagrams of which 26 are coloured in a book of 305 pages is a remarkable achievement.

The book has been divided almost equally into two parts, one dealing with the normal histology and the other with the developmental aspects. The presentation of the entire subject has been shown in such a masterly way that it makes any criticism difficult. The study of the histology and embryology of the human teeth and the associated parts is beset with special

difficulties which are too formidable for an ordinary histologist. It is only the genius of Dr. Meyer which is equal to such a task.

In modern days teeth and gums have come to be recognized as a very important ancillary branch in the study of medical and surgical diseases. The importance of a thorough basic idea of their structure and development is therefore obvious. Before this, there was no book in the English language which could fulfil this purpose and Mr. Churchill deserves the gratitude of all the English-speaking medical men for bringing out an English edition so ably and successfully. We hope this monograph will find a place in every library.

M. N. D.

TREATMENT OF FRACTURES IN GENERAL PRACTICE.—By W. H. Ogilvie, M.D., M.Ch., F.R.C.S. Second Edition. 1936. John Bale, Sons and Danielsson, Limited, London. Volumes I and II. Pp. viii and vi plus 180. Illustrated. Price, 2s. 6d. net each volume

THESE two handy volumes belong to the popular series of pocket monographs on practical medicine. An attempt has been successfully made within the compass of 180 pages to give a practical outline of fracture treatment. Naturally, these volumes are addressed to medical men in practice, in whom a knowledge of general principles has been assumed. In consequence, references to surgical anatomy, skiagrams and illustrations of well-known surgical appliances and splints have been omitted.

The complete book consists of four parts—two parts in each volume. Part I deals with the general principles of fracture treatment and part II with the treatment of fractures of the upper limb and limb-girdle. Whenever possible, the use of local anaesthesia has been recommended for the reduction of fractures. The manipulations described by the author for the reduction of Colles' fracture may be commended. This grip certainly gives a better control of the lower fragment than the 'shaking hands' grip usually employed. Part III deals with the fractures of the lower limb and limb-girdle. The author has recommended the Steinmann pin for skeletal traction, but we much prefer a Kirschner wire for this purpose. For the fracture of the neck of the femur, the Smith-Petersen pin has been rightly recommended in the case of healthy subjects. Part IV deals with fractures of the spine and thorax.

It is quite clear from the list of contents that very little of importance has been left out. In fact, it is a very suitable and up-to-date book for the general practitioner and will be of help to him in the treatment of fractures of all kinds.

P. N. R.

EMERGENCY SURGERY.—By Hamilton Bailey, F.R.C.S. (Eng.). Second Edition. 1936. John Wright and Sons, Limited, Bristol. Pp. x plus 842, with 812 illustrations of which a large number are in colour. Price, 50s.

THE second edition of this popular work has now appeared. *Emergency Surgery* is now published in one volume which makes it more handy than the two volumes of the previous edition. The book deals in a most practical way with those emergencies that are commonly met with, and includes chapters on the ear, nose, throat and eyes, written by collaborators who are specialists in these subjects.

It is well printed, easy to read, and made the more interesting and instructive by the addition of short case notes, illustrating various conditions discussed in the text.

The author has an interesting style, and the illustrations are particularly helpful in bridging over that formidable gap separating the written word from the actual clinical problem set by the patient himself.

The subject-matter is founded on lessons gained from the practical experience of a general surgeon and dispenses with theoretical discussions, thus enhancing the value of the book to the busy practitioner who wants

to know what to do, and how best to do it. Differential diagnosis, indications for operating, operative technique, and after-treatment are all clearly described, giving many details which are not to be found in ordinary surgical textbooks.

The book deserves to be popular, especially in India where skilled and experienced operative help is often not available, and where serious surgical emergencies have to be tackled by comparatively inexperienced (from the operative surgery point of view) medical men.

'Emergency Surgery' is recommended to junior surgical specialists as well as to general practitioners who are confronted with such conditions as septic hands, urgent tracheotomy, diagnosis of surgical emergencies and so forth.

Figure 411 on page 422 appears to be upside down as it depicts infiltration of the intercostal nerve running along the postero-superior aspect of the rib, instead of the postero-inferior, the nerve being shown to lie above the vessels instead of below them.

On the whole this appeals to the reviewer as a very good book indeed.

K. S. F.

ABORTION: SPONTANEOUS AND INDUCED MEDICAL AND SOCIAL ASPECTS.—By F. J. Taussig, M.D., F.A.C.S. 1936. The C. V. Mosby Company, St. Louis. Pp. 536. Illustrated. Price, \$7.50. (This volume is one of the series dealing with medical aspects of human fertility sponsored by The National Committee of Maternal Health, Inc.)

It is curious, but nevertheless a fact, that a woman who has determined to rid herself of her pregnancy, will undergo risks and submit to indignities that she would never consider or tolerate in the ordinary course of her life.

There is a general and growing feeling among the general public and medical profession that the laws regarding abortion require to be revised in the light of present conditions and thought. The only country that has attacked the problem with courage and foresight is Russia. The remainder possess laws that unfortunately drive a determined woman into the hands of the criminal abortionist, often with results that are disastrous. To quote at random from the statistics: In Berlin from 1922 to 1926, out of a total of 2,387 maternal deaths following sepsis 1,886 occurred after an abortion.

Dr. Taussig has written his book on abortion after a survey of the world's literature the bibliography of which occupies no less than 24 pages.

The first 22 chapters deal with abortion from the medical standpoint and the subject is dealt with in detail from the historical to the present-day point of view. The last 6 chapters deal with the social aspect followed by an appendix giving the statutes relating to abortion in the United States.

The author points out that well-conducted abortions have a very low, but badly-conducted abortions have a high, mortality rate. In succeeding chapters he describes the anatomy and physiology, pathology mechanism, treatment, etc., of what might be called well-conducted abortions. The evils of badly-conducted and also criminal abortions are then dealt with.

In a chapter on 'Legalized abortion in the Soviet Union', he gives the results of his visit to Russia, at which he inspected all the State Abortoria. He shows that the policy in Russia is based on facts and common sense, and a woman before obtaining an abortion must first of all satisfy the State that the procedure is necessary. This chapter should be read by all those interested in social problems.

The book is profusely illustrated and well indexed. It has been compiled with great care with the result that there are very few dull pages and there is abundant material for thought. The author is to be congratulated on a work that will become a classic, and which should be carefully read by legislators and others interested in the social welfare of women. To the practising doctor it is the complete textbook.

S. N. H.

A TEXTBOOK OF MIDWIFERY IN THE TROPICS.—By V. B. Green-Armytage, M.D. (Bris.), F.R.C.P. (Lond.), F.C.O.G., Lieut.-Col., I.M.S. (Retd.), and P. C. Dutta, M.B. (Cal.), F.R.C.S. (Edn.), D.G.O. (Dub.), L.M. (Rot.), Captain, I.M.S. Second Edition. 1936. Published by Butterworth and Co. (India), Limited, London. Pp. xiii plus 447. Illustrated. Available from Butterworth and Company (India), Limited, Calcutta. Price, Rs. 8

The second edition of this useful book is an advance on the first both in format and contents. Additions include a classification of the anæmias of pregnancy and their treatment, a chapter on blood transfusion and several illustrations.

The book is written in a vivid and concise style which will commend it to students in this country. Conflicting points of view are omitted; it is essentially the product of long personal experience both in teaching and practice in Bengal and contains many points of practical value which are not to be found in other textbooks. It is dogmatic to a fault, but the authors have done a great service to students and practitioners in this country in bringing out the importance of points in which midwifery in the tropics differs from that described in the standard textbooks, and emphasizing the modifications in prevention and treatment which become necessary as a result. The chapters on the investigation of puerperal pyrexia, the anæmias, and the treatment of diseases of the newborn are particularly helpful in this respect.

The welcome accorded to the first edition will doubtless be extended in greater measure to this one, and one may hope that this book is merely the forerunner of a fuller and more scientific work than has yet been written on the subject of tropical obstetrics.

M. N.

UROLOGY IN WOMEN: A HANDBOOK OF URINARY DISEASES IN THE FEMALE SEX.—By E. C. Lewis, M.S. (Lond.), F.R.C.S. (Eng.). Second Edition. 1936. Baillière, Tindall and Cox, London. Pp. viii plus 100, with 31 figures. Price, 6s.

THE author has written a handbook of 100 pages in order to emphasize certain points which have a particular application to women, and which are not stressed in the usual textbook of urology.

Divided into four sections on the urethra, bladder, ureter and the kidney and appropriately illustrated, the book makes easy and pleasant reading. The author has added after each section a carefully selected bibliography, with which as a starting point the whole of current literature may be reviewed.

It is a book which should prove of interest to gynaecologists and practitioners.

S. N. H.

THE TOXÆMIAS OF PREGNANCY.—By Dame Louise Mellroy, D.B.E., LL.D., M.D., D.Sc., F.C.O.G., M.R.C.P. 1936. Edward Arnold and Company, London. Pp. xi plus 355. Illustrated. Price, 14s.

ALTHOUGH any book by Dame Louise Mellroy would command attention, this one, which is an amplification of her Ingleby Lectures of 1934, is so important that it should be read and re-read by all who are engaged in the practice of obstetrics.

If proof of this be needed it will be found in the first few pages, where it is pointed out that toxæmia of pregnancy is responsible for about twenty per cent of maternal deaths in England and is now the commonest cause of death of a viable fœtus.

The style is both modest and comprehensive, each chapter containing a full account of other authorities' views followed by a description of Dame Louise's own researches, results and conclusions. This method might seem discursive, but so far is this from being the case that on reaching the end of a chapter the reader finds himself trying to evolve theories of his own, than which no higher compliment can be paid to the stimulating quality of the writing.

The author's views are best given in her own words. 'More progress has been made in the prevention and treatment of toxæmia since we ceased to hunt for elusive toxins, and began to recognize that many of the complications of pregnancy are due to some deficiency in nutrition or to some pre-pregnancy disease'.

Theory, pathology, varieties, prevention and treatment are all discussed fully, particular stress being laid on the renal aspect and on the vital importance of recognizing early symptoms so as to prevent late ones, for doing which full instructions are given.

After discussing classification the author divides the toxæmias into two broad groups, hepatic and renal, and agrees with Solomons that the former is likely to go on to eclampsia and the latter to accidental hæmorrhage. She finds that most cases of 'pernicious' vomiting are really 'persistent', and, therefore, amenable to medical treatment, which she also advocates for ante-partum hæmorrhage, supporting her view by quoting forty consecutive cases thus treated by her without a single maternal death. The importance of systematic weight and blood-pressure taking is emphasized, an undue increase being an earlier danger signal than albuminuria. The difficult problem of chronic nephritis in pregnancy and its differentiation from eclampsia is ably discussed and details of blood and urine examination are given. For eclampsia the author favours a modified Stroganoff treatment with glucose and calcium administration. Incidentally, it is nice to find her advising that the same doctor should attend a patient from beginning to end of a pregnancy.

In an interesting chapter on ocular disturbances Dr. Jane Hamilton McIlroy describes amongst other things the reduction in calibre of the retinal arteries in hypertension and the bilateral 'flat detachment' of the lower part of the retina due to oedema in renal disease.

A wise man once said, 'The good obstetrician of the future will not be the one who is best in emergencies, but the one whose patients never become emergencies'. As the object of this book is to encourage the latter class it should be bought by all who wish to do the best for their patients.

H. W.

ROENTGENOGRAPHIC TECHNIQUE: A MANUAL FOR PHYSICIANS, STUDENTS AND TECHNICIANS.—By Darmon Artelle Rhinehart, A.M., M.D., F.A.C.R. Second Edition. 1936. Henry Kimpton, London. Pp. 431. Illustrated with 183 engravings. Price, 28s.

THIS book, as its title indicates, is an account of the technique used in radiography. It is the most complete and yet most readable treatise on the subject that we have yet had the pleasure of perusing.

The opening chapters on elementary physics and electrotechnics are written in a manner which is lucid enough for the veriest beginner to follow. The only omission of note is that of the rotating anode x-ray tube of the Rotalix and Pantix type. But then of course such tubes are not yet manufactured in America.

The author's views on 'basic roentgenological technique' are extremely sound. The Americans—Dr. Jerman I think was the first to lay insistence on it—were the originators of the system of standardizing as much as possible in technique—in other words of keeping as many factors as possible constant. The variable one in most cases is kilovoltage according to the thickness of the part to be radiographed. If only young radiologists and technicians would let this doctrine really sink in, they would avoid a great deal of trouble and produce uniformly good pictures.

In the section on chest radiography, we think inadequate insistence has been placed on keeping to a distance of at least six feet. Not only is there less distortion at this distance, but a larger focal spot may be used with no loss of definition.

In the section on the stomach and intestine we think more should have been said of the production of skiagrams with varying degrees of compression showing

among other things the mucosal pattern of these structures. The advantages of some of the newer types of duodenal selectors, which enable one to get a picture of what is being screened immediately, deserve more adequate mention.

Following American practice the accessory nasal sinuses are radiographed in the recumbent position. As Graham Hodgson has pointed out, the advantages of seeing a fluid level in cases of antral and other sinus suppuration are very considerable and these pictures should always be taken with the head in an upright position.

Despite these criticisms, which as we have said represent the European as opposed to the American practice in most cases, the book is one that we unhesitatingly recommend to all interested in radiology. It is certainly in our opinion the best written on the subject.

The illustrations are admirable and the index very complete.

G. G.

A DESCRIPTIVE ATLAS OF RADIOGRAPHS: AN AID TO MODERN CLINICAL METHODS.—By A. P. Bertwistle, M.B., Ch.B., F.R.C.S.Ed. Third Edition. 1936. Henry Kimpton, London. Pp. xxxi plus 560, with 794 illustrations. Price, 42s.

THIS book has been published with the object of teaching the clinician what properly taken radiographs are capable of demonstrating in all the tissues of the body, in the normal, the diseased and injured states, and the author has certainly succeeded. An interesting introduction styled 'Milestones in radio-diagnosis' gives a history of radiology showing how from the original observation of Roentgen in 1895 to the present day there has been steady improvement in technique with always widening scope in the use of x-rays in diagnosis of disease. A useful character in the book is that many of the radiographs are accompanied with a line drawing giving the names of the anatomical structures portrayed so that one whose knowledge of anatomy is rusty is readily able to identify the various structures.

Needless to say all the photographs are as nearly perfect as can be and one can obtain valuable instruction in a pleasant and effortless manner, for all one need do is turn the pages and study carefully the many beautiful photographic reproductions without the trouble of reading and committing to memory long verbal descriptions.

It is a pleasing and useful book.

NUTRITION IN HEALTH AND DISEASE FOR NURSES.—By L. F. Cooper, B.S., M.A., M.H.E., E. M. Barber, B.S., M.S., and H. S. Mitchell, B.A., Ph.D. Sixth Edition. Revised and Reset. 1935. J. B. Lippincott Company, Philadelphia and London. Pp. xiv plus 711, with 124 illustrations and 1 coloured plate. Price, 12s. 6d. Available from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 9-6

THIS textbook of dietetics for nurses has passed through five editions since it was first published in 1928. The sixth edition has been largely re-written and considerably enlarged to bring it into line with the latest developments in this rapidly extending field. The book claims to include the material suggested by 'Outlines of courses in dietetics for nurses' issued by the American Dietetic Association.

The contents are arranged in two main parts: (1) Principles of nutrition and cookery, and (2) Diet in disease. A very valuable appendix contains tables of food values and methods of nutrition calculation. Each chapter is followed by a summary in the form of questions to help the student to grasp the essentials and verify her knowledge. The preventive aspects of nutrition are emphasized for the public health nurse, and the remedial for the bedside nurse. Special attention is given to diet in infancy and also to the needs of the pregnant and lactating woman. In the section on

'Diet in disease' there is a short chapter on deficiency diseases. The book is written essentially to meet the needs of the nurse student of dietetics in the U. S. A. and gives the impression of being a textbook of sound merit.

M. N.

ALLERGY OF THE NOSE AND PARANASAL SINUSES: A MONOGRAPH ON THE SUBJECT OF ALLERGY AS RELATED TO OTOLARYNGOLOGY.—By F. K. Hansel, M.D., M.S. 1936. The C. V. Mosby Company, St. Louis. Pp. 820, with 58 text illustrations and 3 coloured plates. Price, \$10.00

THE sub-title of this book is 'a monograph on the subject of allergy as related to otolaryngology' but actually it is a book on allergy with special reference to its nasal manifestations. The various important aspects of allergy have been fully discussed, and more than one hundred pages have been devoted to the description of asthma, food allergy, skin allergy, allergic headaches, etc. The question of nasal allergy has been very ably dealt with. The author starts with a consideration of fundamental facts of the physiology, biochemistry, bacteriology and histology of the nose and paranasal sinuses. He then passes on to consider the histo-pathology and cellular reaction of the tissues in allergy and in immunity. The fundamental clinical characteristics of allergy and the important biochemical and other changes in the blood and urine are next considered. This is followed by sixty pages of description of the methods used for testing for the presence of allergy. After this elaborate introduction, the nasal manifestations of allergy, their diagnosis and differential diagnosis are considered in detail. Next comes a description of the associated allergic conditions, e.g., asthma and urticaria, and later chapters on treatment.

It is gratifying to note that unlike many other otolaryngologists the author does not believe that lesions in the nose and paranasal sinuses are of primary importance in asthma nor does he believe that they need radical treatment. He is of the opinion that such patients should first be treated thoroughly by other methods and that the question of operative treatment of the nose should only be considered in those cases where other methods fail. Even then patients should not be subjected to nasal surgery merely because other methods of treatment have failed but each case should be considered individually. The author has based these conclusions not only on his own extensive experience but also on a careful review of the work of others.

D.

THE ESSENTIALS OF PSYCHOPATHOLOGY.—By Professor George W. Henry. 1936. Baillière, Tindall and Cox, London. Pp. ix plus 312. Price, 18s.

THIS book marks a novel departure from the ordinary run of textbooks on psychiatry, a departure that should be welcome to those who are able to appreciate how inadequate in many respects is the orthodox textbook in the light of present-day knowledge. The book is dedicated to Dr. Adolph Meyer, the pioneer of the outlook on psychiatry which Professor Henry has taken as his basis. Besides this important and distinctive feature, the book is probably unique in its inclusion of several case-histories recorded with meticulous care in great detail. The book opens with a very penetrating discussion of the part played by heredity and by environment in the ætiology of mental disorders. The author considers that the uncertainty, which still exists after centuries of disputation on this matter, may be, at least in part, attributable to the failure to recognize the fact that the distinction between these two factors has never been anything but arbitrary. He goes so far as to observe that perhaps the whole question, although of the greatest practical importance in dealing with actual situations, may in the end turn out to be mainly of academic interest. The chapter devoted to the function of the brain repays very careful study. The

author begins with the medulla whence he proceeds upwards to the pons and mid-brain until he reaches the cortex. The author deplors the fact that, in spite of the careful and extensive study of functional illness, no pathology of the brain has as yet been discovered, so that all attempts to explain the phenomena of psychopathology by means of brain function have hitherto met with nothing but failure. In the section dealing with toxic factors, no mention is made of the work of Mayer-Gross and Bromberg who have recently carried out important researches on the effects of administering drugs like mesal and marihuana. The author here indulges in some very suggestive considerations as to the possible effect on the personality of any individual of prolonged emotional stress. Very pertinently Professor Henry observes that although nowadays physicians have become more expert in the recognition and treatment of special diseases, they have lost some of the ability of the old general practitioner to evaluate the human problems that are in the background of almost every case of disordered health. He cites a clinical history which is a splendid example of what is probably a much too common event, i.e., an illness of psychogenic origin so closely resembling one with an organic basis as to lead to a completely wrong diagnosis. There is much that deserves the closest attention in the chapter devoted to a consideration of the part played in the ætiology of mental disturbances in after life, by maladjustment in childhood. In the matter of making psychiatric records, Professor Henry's views will open the eyes of a good many professional readers, particularly in this country where mental hospitals have as yet achieved very little more than custodial assurance. In short, this book should find a prominent place in the library of every institution devoted to the teaching of medicine as well as among the books of anyone who professes an interest in personality disorders.

O. B-H.

NARRATIVE OF AN INVESTIGATION CONCERNING AN ANCIENT MEDICINAL REMEDY AND ITS MODERN UTILITIES: THE SYMPHYTUM OFFICINALE AND ITS CONTAINED ALLANTOIN.—By C. J. Macalister, M.D., F.R.C.P. Together with an account of the Chemical Constitution of Allantoin. By A. W. Titherley, D.Sc., Ph.D. 1936. John Bale, Sons and Danielsson, Limited, London. Pp. 60, with 6 figures. Price, 2s. 6d.

THIS small book gives an account of the common comfrey (*Symphytum officinale*) and its use as a household remedy, with the later discovery that its active principle is allantoin.

Certain remarkable results in the healing powers of this drug are claimed but unfortunately few of them seem to have been published and practically no references are given though we are told earlier work was published in the *British Medical Journal*. Some of the results are so remarkable that one wonders why, in the last twenty-five years since these properties were discovered by the author, the drug is not much more widely used than it is.

One feels there is a catch somewhere and it is possibly to be found in the statement on the chemical constitution of allantoin by Dr. A. W. Titherley in the last chapter of the book, that allantoin is very sensitive to alkalinity and acidity, and is chemically unstable.

The author seems to have a case for the investigation of this drug on scientific lines, but he has presented it badly, as he has been content with advancing its claims in a very slipshod and unscientific manner.

JOHANNES DE MIRFIELD OF ST. BARTHOLOMEW'S, SMITHFIELD: HIS LIFE AND WORKS.—By Sir P. H. S. Hartley, C.V.O., M.A., M.D., F.R.C.P., and H. R. Aldridge, M.A. 1936. Cambridge University Press, Cambridge. Pp. xvi plus 191. Price, 15s.

THIS is an extremely interesting book as it throws considerable light on the state of medicine in England five and a half centuries ago, and is the first writing

on medical matters to come from St. Bartholomew's Hospital.

Unfortunately these documents are not original but are copied from the earlier writings of the Greek and Arabian physicians. The authors of this book have made an exhaustive search of the records with the result that the life of John Mirfield is given and this throws an interesting light on the manner in which hospitals were conducted in those days in very close touch with the church. The evidence of the authorship of the two works, the *Breviarium Bartolomei* and *Florarium Bartolomei*, is fully documented and interesting abstracts from these writings are given at length.

The binding and printing on thick paper are carried out with the excellence one associates with the Cambridge University Press.

It is a book that is a valuable contribution to the early history of medicine in England.

P. A. M.

VITALITY AND ENERGY IN RELATION TO THE CONSTITUTION.—By T. E. Hammond, F.R.C.S. 1936. H. K. Lewis and Company, Limited, London. Pp. xi plus 314. Illustrated. Price, 12s. 6d.

THIS is not a book we can recommend to the serious student of medicine as it is a haphazard collection of the opinions of one man, which are put together in a rather disconnected manner. The book is full of generalizations on insufficient data and may perhaps be best described in the words of the author himself, by an abstract from the last chapter. 'I am only too aware how fragmentary is this book. The problem of life is, however, so vast that the difficulty is to know what to include. Rather than attempt to give a résumé of life as a whole, I have considered it advisable to deal only with those aspects that have interested me. Reference is made only to writers whom I knew as a student or who were then quoted to me and in whose books I find pleasure in meditating'. This indicates a collection of random jottings not calculated to be of general interest.

MANUAL OF EMERGENCIES, MEDICAL, SURGICAL AND OBSTETRIC: THEIR PATHOLOGY, DIAGNOSIS AND TREATMENT.—By J. Snowman, M.D., M.R.C.P. (Lond.). Third Edition. 1936. John Bale, Sons and Danielsson, Limited, London. Pp. ix plus 401. Price, 10s. 6d. Postage free

SNOWMAN'S *Manual of Emergencies* was originally based upon Lenzmann's *Emergencies*, and his excellent scheme has still been adhered to, but very little of the original remains in the present edition, in an attempt to make it up to date. This is the third edition (there is no reference to the previous ones) and according to the author it has undergone complete revision. It presents a résumé of the modern teaching of standard British authors on medical, surgical and obstetric emergencies. There are not many handbooks which deal solely with the common emergencies which threaten life, and Dr. Snowman's book is therefore welcome.

The book first deals with shock and then dangerous emergencies in disease of different systems of the body. Poisoning has been included, but accidents such as burns and drowning have not been dealt with. In connection with laryngeal diphtheria the author makes it a rule that chloroform should be used as the anæsthetic. It is not essential, but rather dangerous at times in diphtheritic children with obstructed breathing. (The reviewer has performed over a hundred tracheotomies without chloroform anæsthesia). Under 'Loss of consciousness' various causes and their treatment have been described but cerebral malaria has not been mentioned; this is a serious omission especially for the practitioner in the tropics. Under 'Acute gastro-enteritis', which includes Asiatic cholera, the author considers the acute diarrhoea to be best treated by tincture of opium—this cannot be regarded as the most modern teaching. Venesection has been recommended for cases of cerebral

hæmorrhage; this is now regarded incorrect by some authorities.

Apart from these points the book seems to be quite sound. It should prove a very useful and handy volume for students and practitioners.

R. C.

DISEASES OF THE EYE.—By Sir John Herbert Parsons, C.B.E., D.Sc., F.R.C.S., F.R.S. Eighth Edition. 1936. J. and A. Churchill, Limited, London. Pp. viii plus 705, with 21 plates and 360 text-figures. Price, 18s.

THIS book is so well known it needs no introduction. It has been a standard work for years and is the best of its class.

This is the eighth edition and no very radical changes have been made in it. But the same care has been taken to retain the relative importance of details so that the student and the medical practitioner may view them in their proper perspective. The author has rightly considered it advisable to refer briefly to some modern advancements in treatment, such as the electrical treatment of detached retina.

Also attention has been directed to recent researches in the physiology and biochemistry of such substances as histamine and acetylcholine in nerve stimulation, axon reflexes, vitamins and viruses. Also to the very encouraging advances in our knowledge of the biochemistry of the lens. A word of praise may not be out of place for the last two chapters of this book although they are not new in this edition. They are chapter 36 which deals with the causes and prevention of blindness and chapter 37 which deals with the hygiene of vision. The book finishes with three appendices which contain much valuable information.

H. S. C.

LIPPINCOTT'S QUICK REFERENCE BOOK FOR NURSES COMPILED AND ARRANGED FROM VARIOUS SOURCES.—By H. Young, R.N., with the assistance of G. A. Morrison, R.N., and M. Eliot, R.N. Second Edition. 1935. J. B. Lippincott Company, Philadelphia and London. Price, 9s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 6-12

THIS is a small handbook of pocket size containing a large amount of information in a very small compass. It is designed primarily for the nurse but will meet the needs of others wanting first-aid nursing knowledge for immediate use.

The book is arranged in sections under six main headings: (1) General information; (2) Materia medica; (3) Nursing technique; (4) Diets; (5) Medical and surgical nursing; and (6) Obstetrical nursing. General information contains tables of weights and measures, dosage for children and popular names of drugs. Materia medica contains notes on the action and uses, administration and the more important preparations of the drugs in ordinary use. Nursing technique contains in note form the essential points of general nursing methods arranged alphabetically and very simply and clearly expressed. The diet section contains amongst other information a table of the caloric values of average servings of foods in ordinary use and a classification of fruit and vegetables according to their constituents. Diets are suggested for many surgical and medical conditions and for use at different times of life in health and disease. Medical, surgical and obstetrical nursing consists of short notes on subjects arranged alphabetically and can be used for ready reference or to refresh the memory of the student nurse before examinations. Tables of contagious diseases and of the treatment of poisons are printed inside the cover.

This handbook has the defects of all synopses, but the amount of accurate and useful information compressed into such a small space and arranged so easily for quick reference should give it a definite place for use along with larger textbooks.

M. N.

THE DIABETIC A. B. C. A PRACTICAL BOOK FOR PATIENTS AND NURSES.—By R. D. Lawrence, M.A., M.D., F.R.C.P. (Lond.). Fourth Edition. 1936. H. K. Lewis and Company, Limited, London. Pp. vii plus 62. Price, 3s. 6d.

THE previous edition of this practical little guide for diabetic patients was reviewed by us about a year ago.

No fundamental changes have been made in the present edition except that the table of food values has been changed throughout to accord with the new analyses by Dr. McCance and his colleagues at the King's College Hospital.

We hope the book will continue to be a useful help to diabetic patients, especially those who use the author's *Line Ration Diet*.

J. P. B.

BAILLIÈRE'S SYNTHETIC ANATOMY.—By J. E. Cheesman. Part XIII. (Complete in fourteen parts.) Published by Messrs. Baillière, Tindall and Cox, London. Price, 3s. per part

THE last part of this really remarkable publication has now appeared. The whole body has now been covered in this anatomy in 14 parts, which can be bound together between strong boards to form a single volume of an handy size, or they can also be obtained separately.

Each part deals with a single region, e.g., the hand, the foot, the abdomen, the male perineum; it consists of about a dozen plates that are printed on a transparent material; on each plate only the structures that lie in one layer are included, e.g., the superficial vessels and nerves, the fascia, the tendons, and so on,

down to the bone which forms the central plate, beyond which the reverse aspect of that region is built up layer by layer, finishing with the superficial vessels of that aspect. Each plate can be studied separately by placing a piece of white paper under it; this is conveniently provided by a central blank sheet in the key index; or it can be studied in conjunction with the plates underneath as they are transparent and printed in numerous distinctive colours; the plates are bound together so that they will always fall into position again and the exact relative position of the various structures can be seen at a glance. When one wants to study the deeper structures only, the superficial plates can be turned or rolled back. Each structure is numbered and there is a key index, which has been referred to above, provided with each part. There are many other useful features about this anatomy which it is impossible to mention in a short review.

This synthetic anatomy provides the very best substitute for the human body that one could imagine, even better than some of the elaborate anatomical models that one sees in some up-to-date anatomy departments. It will not replace dissection of the human body, and the publishers are most careful not to make an extravagant claim of this kind, but it will make redisection of any part unnecessary, as once a student has carried out a dissection, this anatomy will bring it back to his memory in a vivid manner.

We have in the past expressed some doubts as to the effect of the Indian climate on these plates, but we now find that the earliest parts, published some years ago, are still perfectly serviceable. The price of the whole publication is very moderate and really very remarkable value for the money, and we strongly recommend it to the student and his teacher in this country.

Abstracts from Reports

ANNUAL REPORT OF THE PUBLIC HEALTH COMMISSIONER WITH THE GOVERNMENT OF INDIA FOR 1934. VOLUME II

SECTION I

On the health of the British Army in India

Cysticercosis.—Two cases of this disease occurred, one of which was rapidly fatal. Much attention has been directed to the hygienic control of piggeries and to the examination of pork, in the hope that a decrease in infestation with *T. solium* (40 cases of which occurred among British troops) may lead to a corresponding decrease in cysticercosis. All officers are alive to the importance of this subject, and all known steps for the prevention of the disease are being taken.

Twenty-six cases of the various types of epilepsy were invalided during the year.

Dengue.—The incidence is the lowest that has been recorded in the last 10 years.

As in previous years, the disease is confined mainly to the garrisons of ports. The incidence of dengue bears a close relationship to that of malaria, as can be seen in the table which shows the ratio per 1,000 for the last 10 years. In most years the incidence of malaria is approximately 10 to 12 times that of dengue.

of continuity in the appointment of officers specially selected for investigation of this disease.

Under the present conditions, in the localities in which this fever is of importance, it is not practicable to prevent sandflies from breeding. Neither are the climatic conditions such that the use of small mesh nets can be advocated. As funds permit, old and unsuitable barracks in certain of these stations are being replaced by barracks of improved construction and design, from which it will be much easier to eliminate sandflies. It is hoped that this measure will give rise to some improvement.

Fevers of the typhus group.—The increased number of cases of fever of the typhus group which have been reported this year does not necessarily indicate an increase in the incidence of the disease. It is more probably a sign of the greater interest which is being taken in this condition and of the improved methods of diagnosis which are available.

Special case sheets have been maintained for all these cases and an examination of the results of 110 cases (all ranks, British and Indian, and their families) reported on these forms reveals various points of interest and importance which have not previously been fully realized.

TABLE

		1925	1926	1927	1928	1929	1930	1931	1932	1933	1934
Dengue	..	14.3	26.6	14.1	17.5	6.8	9.4	11.8	7.8	11.7	6.6
Malaria	..	159.0	165.3	138.8	91.3	116.0	118.4	112.5	84.1	103.3	67.5

Sandfly fever.—Research on this subject has suffered an unfortunate check through inability to maintain lack

The Indian form of this disease is commonly known as Indian tick typhus—although this actual name has

not been used in Army nomenclature since 1932—and the generally accepted idea is that only one type of the disease exists in the country.

As the result of testing the serum of all cases against standardized suspensions of the 'O' antigen of *B. proteus* X2, XK, and X19 it has been definitely shown that a type of typhus, closely related in its clinical and serological characters to 'scrub typhus' of Malaya, is to be found scattered throughout India. In the period under review this had a very definite seasonal incidence, the vast majority of cases occurring between the middle of August and the beginning of October—i.e., during the latter portion of the monsoon. The rash in these cases was relatively inconspicuous and disappeared completely in about 7 days. There was a well marked rise in agglutinins of the XK type, accompanied by practically no co-agglutinins for X2 and X19. No evidence was forthcoming as to the vector. None of the cases gave any history of tick-bite. By analogy, it seems possible that a mite may be responsible.

Another type of the disease first appearing in July and rising to a maximum in December occurred chiefly in certain districts in the Southern Command. This is undoubtedly the form which has been described as 'Indian tick typhus'. The rash in this type of the disease differs in certain important particulars from that which occurs in the XK type. It is much more conspicuous, is generalized in distribution—being present on the palms and soles—and is of prolonged duration persisting in certain cases for a month or more, the average being from two and three weeks. On the whole the symptoms are more severe in this than in the XK type of case. The serological results in these cases are variable in some, agglutinins for X2 predominate; in others, the balance is in favour of X19. It would appear that this is probably a group response, and that the strain of *B. proteus* which embodies the main antigen of this virus has yet to be discovered. In the 1934 series of cases there is no evidence that the patients were bitten by ticks, and the question of the vector must remain an open one, although there are undoubtedly grounds for suspecting the tick. This matter is being investigated. These cases bear a very close resemblance to the Rocky Mountain fever, *fièvre boutonnense*, African tick-bite fever group, differing from the two latter in not showing a primary lesion.

A third type of the disease is found chiefly in the south of India, the majority of cases having occurred this year in Bangalore. Most of the patients were Indians and showed no rash. A transient rash of varied type and distribution appeared in 5 of the 6 British cases. This type had no definite seasonal incidence, but was absent during the hot weather months. The serum in most of the cases agglutinated X19 to a high titre. It is of course possible that this type may be merely a variant of the second type, but on the whole there is good reason to regard it as an entity, possibly a member of the endemic typhus (flea-borne) subgroup. There is no evidence of either tick or louse transmission. Experiments with rats and rat fleas have up to date been negative.

Certain cases have occurred which, in the absence of further information, cannot at present be placed in any of these three groups.

Three cases had a fatal termination. It is considered that all of these belonged to the second group.

An interesting point common to cases of all types, and one which explains why the correct diagnosis has been overlooked in the past, is that many of them show a well marked rise in agglutinins for one or other of the enteric group organisms. Blood cultures have of course been carried out and have given negative results in this respect. It is proposed to make use of absorption tests to throw further light on the exact nature of these agglutinin reactions against both proteus and enteric strains.

A few cases have developed a positive Wassermann reaction which has gradually subsided to negative during convalescence.

These fevers have been almost entirely confined to males. In the series of 110 cases, one, which occurred in a girl aged 10, is the only deviation from the rule.

Pyrexia of uncertain origin.—The number of cases classified under this diagnosis continues to decrease.

Enteric fevers.—The incidence among British troops has decreased almost by half, reaching a lower level than has ever previously been touched. Among Indian troops the decrease which has been in progress in recent years has been maintained, but this is in no way proportionate to the very marked drop which has occurred among British troops. Deaths have been halved among British troops, and decreased from 23 to 15 among Indian troops.

There has been no epidemic outbreak among the troops, the majority of cases having been sporadic in nature. Occasional groups of two or three cases have occurred denoting a common but transient source of origin. In the examinations of menials which were carried out during the year (10,572 men being examined with a total of 35,895 tests), 7 carriers (6 of *Bact. typhosum*, and 1 of *Bact. paratyphosum A*) were discovered. The absence of outbreaks bears witness to the fact that the system which is in vogue is producing the desired result.

As a contrast, it may be mentioned that in one area a number of cases occurred in families which had moved to the hills and were staying in hotels and clubs. No carrier was discovered, but the distribution of the cases left no doubt that that one or more carriers were responsible.

There is nothing new to report from the point of view of diagnosis or treatment. Faith in the value of the agglutination test as a method of diagnosis is being further undermined by results which have been obtained in repeated routine tests in cases which prove to belong to the typhus group.

It is perhaps worthy of mention that in cases of typhoid fever proved by the recovery of the organisms, agglutination against a 'TO' suspension was negative in over 80 per cent, the dates of the last tests performed in each case ranging between the 5th and the 41st days. In the 20 per cent of cases in which agglutination occurred at a titre of from 1/125 to 1/250, this was found by the 9th day at latest. These results go to confirm the previously expressed opinion that, while positive results from the test may be of significance, negative results, which are most numerous, cannot be regarded as of any diagnostic value.

Dysentery, diarrhoea, colitis and amebic hepatitis.—The admission ratio is the same as that for 1933. The average constantly sick ratio, the average sick time in days, and the average number of days lost per 1,000 per annum all show slight decreases indicating that the type of case was less severe than in the previous year. Ten men were invalidated (5 amebic dysentery, 5 bacillary dysentery) as opposed to 8 in 1933, but there were no deaths (1 in 1933).

The position is disappointing. In practically every other disease except dysentery, the general improvement in the hygienic environment of the soldier has led to a decrease in incidence. In dysentery the general trend is in an upward direction in spite of all the measures which have been taken to control it. The widespread distribution of the disease in the civil population and the primitive system of disposal of excreta which exists in most stations, combined with the presence of flies, create a problem which has so far defied solution.

The general lines of treatment remain the same, and are on the whole satisfactory. The great majority of cases were of a mild nature.

The incidence of dysentery in Quetta remained at a high level during the first 8 months of 1934. Thereafter the figures are below those of 1933, and it seems possible that the outbreak is abating. Subsequent figures support the view.

Tropical abscess of the liver and hepatitis.—There were 69 admissions under the above heading, of which 52 were considered to be amebic in origin. The actual number of cases was 48, as two cases relapsed once, and one twice.

Only four cases developed to the stage of abscess formation, and it is interesting to note that these were all 'old soldiers', i.e., one assistant surgeon, one regimental quartermaster sergeant and two sergeants. Two of these four cases were fatal. The majority of the remaining cases were early and trivial, and symptoms quickly subsided when emetine was administered.

Malaria.—Admission ratios per 1,000 of strength, British soldiers, since 1921 (i.e., since the settled, post-war period began) may be contrasted thus:—

Best malarial years		Worst malarial years	
1928	.. 91.3	1921	.. 321.7
1932	.. 84.1	1924	.. 206.8
1934	.. 67.5	1922	.. 175.4

The 1934 figure is better than the previous best by no less than 16.6 per mille.

Although these are remarkable figures, yet it would be a big mistake to imagine that they are likely to be surpassed, or even maintained. The recent severe epidemic in south-west Ceylon, and the history of malaria in India itself warn us against premature optimism. Before exchanging caution for confidence, it is essential to consider, in a comparative way, all the important aetiological factors which may influence the incidence of this disease.

It is thought that examination of the statistics, coupled with comparative study of the aetiological factors, will tend to the opinion that, of late, a real and permanent improvement has occurred in the malarial situation in the Army in India.

Now and again disturbing influences may—and almost certainly will—arise to lower the present record incidence. For example, were financial stringency to become more intense, no doubt the anti-malaria grant would be still further reduced; were operations in the field to be undertaken during adverse weather conditions, the unpleasant experiences of 1933 would inevitably be repeated; or if for some reason such as war, the supply of plasmoquine were interfered with or stopped, then the proportion and severity of the relapses would revert to the standards which existed prior to 1932.

However, such checks to progress are beyond medical control.

It is now proposed to set forth the grounds on which is based the belief that a real and permanent improvement has occurred; and for this purpose the past three years, 1932–34, will be compared.

Periodicity of epidemic malaria is an important factor. In one of these years—1933—this factor was encountered in a severe form in the north-western sector of the country, where so many of our troops are stationed. There, a number of the garrisons suffered heavily; and yet, the admission ratio per 1,000 was only 103.3; at that time, the third in order of merit since 1921.

Apart from periodicity, meteorological conditions are those which exercise the dominant influence in the incidence of this disease in India.

In 1934, and speaking generally, meteorological conditions were adverse. They presaged a comparatively heavy malarial toll.

In June the monsoon was somewhat late in appearing. Subsequently it became rapidly established, with well distributed rainfall over the country. Excessive rainfall in and near the Assam hills caused serious flooding of the Brahmaputra. This month's fall, averaged over the plains, was in excess by 4 per cent.

In July rainfall was normal except in north-west India. Locally, very heavy rain fell in the hills of the east Punjab and the U. P., causing extensive floods in the Chenab, Beas, Sutlej, Indus and Raoti: this is over an area containing many of the bigger cantonments. Averaged over the plains of India, the month's rainfall was in defect by 1 per cent.

In August the monsoon displayed normal activity over the whole country except in the north-west during the first three weeks, and over the peninsula as far north as the Central Provinces during the last week of the month. Serious floods again occurred in well

garrisoned areas, namely, in the valleys of the Ganges, Jumna, Gandak and Padma, with consequent water-logging in parts of the U. P., Bihar and east Bengal.

In September the monsoon was strong in the central parts of the country—where a number of fairly big garrisons are located—normal in Burma and north-east India, and weak elsewhere. Averaged over the plains, the month's fall was in excess by no less than 9 per cent.

In October the total rainfall was in large excess in south-east Madras; slight to moderate excess in Upper Burma, Assam and Bengal; normal in Lower Burma and the east Central Provinces; slight to moderate defect in other parts of Bengal and Madras; and in large defect elsewhere. Averaged over the plains of India, the month's rainfall was in excess by 2 per cent.

To summarize:—

The active period (June to September) of the monsoon of 1934, over the whole of India, yielded a rainfall which varied from normal to excess. In some cases the excess was great, and affected a number of important military localities.

In the transition period (October) rainfall was more or less in defect. Over some areas—including those in which the bulk of the troops are stationed—the defect was marked.

The meteorological review leads to the opinion that, in 1934, weather conditions were against a good malaria year.

In comparing annual incidences of malaria with annual meteorological conditions, there are, of course, a number of concomitant factors, the presence or absence of which must be taken into account. Periodicity of epidemic malaria has already been mentioned. Also, it must never be forgotten that, whereas in a particular year general meteorological conditions may be adverse locally they may be quite favourable; extensive areas may be heavily rained upon and flooded while cantonments in the same district may have the luck to escape. Then there is the factor of 'carry-over' of cases. Unfortunately, the statistical year does not coincide with the true malarial year; and any statistical year under review may have been preceded by a good or a bad malarial year. Its figures will be favourably or adversely affected accordingly. Finally, there must be taken into account the fortuitous factor, field service; and also its allied condition, civil disturbance. The circumstances of war and of active internal policing are, by their nature, powerfully antagonistic to malarial prophylaxis.

In 1934 epidemic malaria did not occur. Local meteorological conditions were generally adverse, and often markedly so. The 'carry-over' from 1933 was fairly heavy. The position was not handicapped by war or civil disturbance.

Details regarding the corresponding factors in 1933 and 1932 may be studied in the War Office Reports on the Health of the Army (India section) for the appropriate years. They are shown below in tabular form. A plus sign indicates that the factor was favourable to a good malaria year: the minus sign indicates that the factor was adverse.

	Epidemic malaria	Weather conditions	'Carry-over'	War and civil disturbance.
1932	+	—	—	—
1933	—	—	+	—
1934	+	—	—	+

In itself, this rough picture is of no value; but if its constituents be examined separately and compared, it will be seen, firstly, that expectation would have made 1933 a worse year than it actually turned out to be; and, secondly, that expectation would not have made 1934 as good as it turned out to be. There were grounds for forecasting that 1934 would be an improvement on 1933; but, on the above factors alone, there were no reasons for supposing that the 1934 figures would surpass those of 1932.

In the interests of prophylaxis, it is necessary to formulate an opinion as to why the 1934 statistics are so eminently satisfactory. The term 'eminently satisfactory' is used purposely instead of 'surprisingly satisfactory', because it is believed that certain comments and prognostications made in these reports during the past three years have now been justified. These concern three additional factors, *viz*, the effect of the new synthetic drugs, plasmoquine and atabrin; the improved standard of anti-malaria field work resulting from the training at Karnal; the re-awakening of interest, and the application of more scientific methods, amongst the clinicians.

As these matters have already been dealt with in recent reports, it is only necessary to revert to them briefly now. It is beyond doubt that quinine-plasmoquine, as used in military medical practice in India, results in a more radical and more rapid cure of malaria than does the administration of quinine alone. It is also beyond question that atabrin-plasmoquine effects a quicker cure than does quinine alone. In certain cases quinine will continue to be more or less commonly employed: it has its advantages. In others atabrin and (or) plasmoquine are the drugs of choice—though it is not contended that these drugs, used singly or in combination, are complete and perfect remedies. They merely signalize a great step forward in malarial therapeutics. How great that step is may be measured with a fair degree of accuracy, by comparing the total admission rates, on an all-India basis, from year to year, by studying the ratios of relapse to fresh cases, and by noting the varied lengths of time deemed necessary to rid a patient's system of parasites, in accordance with the particular form of treatment prescribed.

Mention has already been made of the remarkable fall in the all-India admission ratio; and it has been pointed out that this decline is not confined to the year under review. Even in a very bad year (1933) the ratio was much below expectation.

As regards the relapse rate, the following is an extract from remarks in an annual report for 1934, made by a competent and reliable observer.

'It seems clear that fresh cases of malaria are very rarely, if ever, contracted in the military cantonments of the Madras district. *A. subpictus* and *A. fuliginosus* have been identified in Madras and Bangalore, but none of the anophelines usually recognized as carriers.

Analysis of all the cases in the Q. V. O. Madras Sappers and Miners, Bangalore, the largest source of our malarial figures, shows that every case except one was admitted to hospital within a week of returning to Bangalore either from leave to his home, camp duty, or duty in frontier stations.

The treatment of these cases by plasmoquine and quinine or plasmoquine and atabrin has been so successful that *there has been no relapse for 2 years in a total of 112 cases*. The absence of any possibility of local re-infection makes Bangalore very suitable for judging the results of treatment.

If we pass from this to an area where re-infection within cantonment limits is an everyday occurrence, we find the Assistant Director of Hygiene and Pathology, Northern Command, remarking thus:—

'The Command relapse rate has fallen to 36.7. Many of the relapse cases were, however, the result of fresh infections contracted in 1933, during the Mohmand-Bajaur Operations'.

This is very different from the state of affairs which prevailed prior to the advent of the new drugs, when the relapse rate was customarily round about 90.

In this report for 1933, it was shown that relapse rates vary according to therapeutic and nursing conditions; and these conditions were classified under 'specialized', 'selected' and 'general practice'. Other things being equal, it may now be said, with confidence, that the following are conservative estimates of the relapse rates in these three classes:—

'Specialized'	..	8 per cent or under
'Selected'	..	Average, 12 per cent
'General practice'	..	Maximum 30 per cent

If these figures are exceeded, there is something amiss with the treatment of the patients: an extraneous factor is at work, such as war, or the effects of war; or re-infection is taking place.

In making a differential diagnosis, fresh or relapse, this question of re-infection is an extremely difficult one to settle; and especially so in that area—the Punjab and the frontier—from which so much of the Army malaria comes. (The conditions in Bangalore are very exceptional.) However, it is not for this reason that the table showing fresh and relapse cases, by Commands, has been omitted from this year's reports: the omission is due to the following circumstances:—

In order to make the case against the new synthetic drugs as black as possible—in order to eliminate personal prejudice in their favour—it was decided that all admissions subsequent to a primary admission should be regarded as relapses: that the question of re-infection should not be considered at all. The results were disappointing: quite early in the malaria season it became plain that many cases labelled relapses were, in fact, re-infections.

The issue was further complicated by the fact that, in Waziristan District and throughout Southern Command, an experiment on a big scale was in progress, with the object of shortening the quinine-plasmoquine course of treatment. In the above area, this course was cut down from the routine period of 21 days to 14 days. This must have resulted in the inclusion of a still bigger percentage of re-infections, under the heading of relapse—particularly in the case of Waziristan where (as in the rest of Northern Command) the risk of re-infection during the malaria season is abnormally high: very much higher than in Southern Command.

Despite the unfair weightage above described, the relapse [*sic*] percentages were well below expectation, and much below those met with in the days before the new drugs were brought into use. In Southern Command the percentage was 25; in Waziristan District, 40; and over all-India, 36.

Improvement in the standard of field work continues, as more and more Karnal-trained officers become available. Nevertheless, supply does not equal demand, for qualified officers of the Royal Army Medical Corps return to England from time to time, tour-expired; and those of the Indian Medical Service are not infrequently transferred to the civil side, their services thereby being lost to military. It would be of great benefit to the Army if more military medical officers could be trained annually at the Ross Field Experimental Station for Malaria, Karnal.

Finally, mention must be made of the clinician, to whom too little credit for the improved malarial statistics has been awarded in recent years. The medical specialists in particular have devoted much time and attention to the therapeutics of the disease; and their investigations and reports thereon indicate a big advance in scientific outlook and practice.

In connection with mosquito-proofing, a curious and instructive incident occurred at Allahabad. Owing to the fact that most of the malaria contracted in that station was traceable to garrison duty in the old fort, it was decided to proof the buildings. The work was completed in January 1930 at a cost of a little over £1,350.

The admission ratio *per mille*, for malaria at Allahabad, averaged over the years 1925 to 1931, was 109. In 1932 it was 49; and in 1933, 40.

In May 1934 the whole fort was denuded of its mosquito-proofing. This measure was carried out at the instance of the local authorities, after sanction had been obtained from Command Headquarters. The reasons put forward in support of this retrograde step were that the netting shut out light, interfered with ventilation, and collected dust and debris to such an extent that cleaning became impossible.

In 1934 the admission ratio rose to 120 *per mille*.

At this stage it is not considered desirable to comment on this matter, because the monsoon of 1934 at Allahabad was unfavourable. But at least the incident has afforded a valuable lesson, to wit: that the proofing

of old barracks should not be undertaken without serious consideration. The original design and construction of these old buildings may not lend themselves to this measure.

Lahore Cantonment (British) is a station which is almost completely mosquito-proofed. In this notorious station the average annual malarial incidence for the five years 1923-27 was 743. Proofing was carried out in 1927-30. The average annual incidence for 1928-33 was 124. (This Report for 1933.)

In 1934 the incidence was 43.

Between the years 1902 and 1908 this cantonment was subjected to a very intensive and expensive anti-malaria campaign. However, the disease did not decline; and even a change of name (in 1906) from 'Mian Mir' to 'Lahore Cantonment' produced no amelioration of the incidence of malaria. In the days of Akbar and Jehangir, Mian Mir was a religious teacher and preacher of great sanctity and renown and it would now seem as if the time had arrived to revert to the ancient name. The memory of this fine old saint was permitted to be extinguished because of a medical failure. It is but right and proper to make amends, and restore him to memory, now that medicine has triumphed.

Further investigations have been carried out regarding the effects of 'cold storage'. As was indicated in the Report for 1933, this measure is nothing like as effectual as, originally, it promised to be. For instance, the following question was put to Northern and Eastern Commands:—

'What is the ratio per 100 of all British troops in the Command who benefited by the measure known as "cold storage", during 1934? By "benefited" is meant residence in a hill station for the four months, 1st July to 31st October, inclusive'.

The answers are given below:—

Northern Command		Eastern Command	
Peshawar District	128	Meerut District	427
Rawalpindi District	33	Lucknow District	272
Lahore District	269	Presidency and	
Waziristan District	793	Assam District	248
		Delhi Brigade Area	240

In a way, these figures are a measure of the facilities at the disposal of administrative authorities for placing the troops in the Hills. In Peshawar District these facilities are poor; in Waziristan and Meerut Districts they are comparatively ample. The Rawalpindi figure is very low because, in that district, the bulk of the troops have moved down to the plains before 31st October. If 30th September had been substituted for 31st October, the ratios would have been better all round; but primary malaria is common in the plains during October; and often this is the worst month of the year. Men who are in the plains in October cannot obtain the full benefit of 'cold storage'.

It amounts to this, then, that in the two most malarious Commands, and for the reasons mentioned in last year's Report, only about twenty-five per cent of the troops enjoy the full benefit of this measure.

One of the most encouraging features of the year 1934 was the interest shown here and there by authorities other than military in the anti-malaria problem. With the exception of Quetta, this interest was neither intense nor financially adequate; but a beginning has been made, and it is hoped that, from this, the participation of civil and municipal authorities in the anti-malaria fight will develop.

In 1933 there occurred, in connection with malaria, 10 cases of hæmoglobinuria, with 6 deaths. In 1934 there were 3 cases, with 1 death. Of the two patients in 1934 who recovered, one was a sepoy in Muttra who had received atebirin, 0.1 gm. thrice daily for 7 days, followed by 0.01 gm. plasmoquine twice daily for two days. The pigment present in the urine was reported to be methæmoglobin. Rapid recovery followed appropriate treatment, including stoppage of plasmoquine. The second case was that of a British soldier who was enlisted in India, and who had never

resided out of the country. The case occurred at Lahore. He had received atebirin, 0.1 gm. thrice daily for 7 days, followed by 0.03 gm. [plasmochin] (in two doses of 0.01 and 0.02 gm. respectively) daily, for three days. In this case oxyhæmoglobin was reported. Recovery followed suitable treatment.

Although malaria remains the scourge of the British Army in India, the portents—as measured by sustained, if gradual, progress—are encouraging.

SECTION II

On the health of the Indian Army in India

[This section is composed of little but statistical tables, so is not suitable for abstraction, but it will be seen that in the discussions abstracted from Section I the various problems, as they affect the Indian Army, are considered there.]

REPORT OF THE COMMISSIONER OF PUBLIC HEALTH FOR THE YEAR 1935. SHANGHAI MUNICIPAL COUNCIL, PUBLIC HEALTH DEPARTMENT

Vital statistics.—Generally speaking, the health of the International Settlement during the past year has been satisfactory. The foreign birth rate was 22.90 per mille (15.60 in 1934) and the death rate 12.54 (11.34 in 1934).

The Chinese death rate (based on figures from the usual sources of information) was 11.98, against 14.25 in the previous year and is the lowest recorded for ten years, though for reasons which have been fully discussed in previous reports the above figure cannot be considered of value for comparative purposes.

The quinquennial census taken during 1935 enabled vital statistics to be calculated rather more accurately, and for the first time in the history of the Settlement the Chinese birth rate (18.35) is recorded. Both the birth and death rates for the Chinese community, however, must be regarded with considerable reserve, as accurate statistical figures relating to the Chinese population are not likely to be achieved for many years, owing to reluctance on the part of the community to reveal such information.

Cholera.—This is the third year in succession during which cholera has been practically absent. In view, however, of the limited knowledge of the epidemiology of the disease in this country, it is impossible to form any opinion of the probabilities of its presence or absence next year. It will be necessary, therefore, to repeat or renew preventive measures, and it is to be hoped that quarantine measures may prevent the disease from spreading from endemic sources, wherever they may be situated.

Whilst perhaps not an entirely sound argument, nevertheless the fact that cholera has been entirely absent for this period must tend to discount the opinions of those authorities who claim that it is endemic in Shanghai. Endemicity implies the constant presence of a disease and it is difficult to understand how it can be that reports still appear in various periodicals suggesting that the disease is endemic in a town where it has been absent for two or three years.

Typhoid and paratyphoid fevers.—Typhoid, which diminished some years ago, remains somewhat higher than is at all satisfactory. It is not an easy matter, however, to suggest further prophylactic measures, though it is possible that the compulsory pasteurization of milk, which will come into force next year, may assist in controlling this disease. Typhoid is a disease which, once the major sources of infection—such as water and foodstuffs—have been adequately controlled, becomes to some extent a matter for personal prophylaxis. Hence gradual elimination may in part be in the hands of the public itself, and it is felt that possibly the increased supply of vegetables grown under hygienic conditions may be responsible for a certain slackness on the part of the community in the supervision of this branch of the dietary.

Malaria.—This disease, which is giving rise to anxiety at the present time, is slowly and insidiously increasing. It is considered that this may be due in some degree

to improved communications and the resultant migration of the public to country districts during the summer season. At all events it will be necessary to intensify anti-mosquito measures and a number of experiments were undertaken during the year with a view to reducing the cost of the larvicides used, thus allowing wider application without diminishing the efficacy of the anti-mosquito campaign. It is not possible at the present time to state whether any helpful results have been obtained, but one or two interesting observations have been made.

Rabies.—Rabies amongst dogs increased considerably, but due to the strenuous efforts of the police force, a considerable improvement was effected, though it appears unfortunate that owing to various difficulties the measures taken could not be spread over a wider area of the surrounding territory.

Hospital development.—Whilst the current depression resulted in a temporary cessation in the development of the department's hospital and other buildings programme, this was to some extent offset by the development of other hospitals in outlying districts. It is hoped, however, that this position will not continue indefinitely, as certain of the Municipal hospitals have, owing to their age, been condemned as unsuitable buildings, and it is felt that only the absence of an epidemic saves them from proving themselves inadequate for the needs of the population. Whilst the Settlement has been particularly fortunate in the last two or three years in this regard, one has to assume that sooner or later the swing of the pendulum will take place with the result that hospital and other accommodation will be urgently needed.

School medical service.—In the realm of preventive medicine, the new School Medical Service is already proving its value in limiting the spread of infection amongst school children. A perhaps trivial, but interesting, example of this was the limitation of a small epidemic of diphtheria in a Chinese school. Sixteen positive cases occurred, but upon discovery and rigid isolation of 'carriers' and 'contacts', the outbreak was controlled, and no further cases developed. Proof of the value of the action taken was found in the fact that further cases occurred in the household of the isolated carriers who themselves had not been impressed by the necessity of the precautions taken by the department.

SIXTIETH ANNUAL REPORT OF THE CHEMICAL EXAMINER'S DEPARTMENT, BENGAL, FOR THE YEAR 1934

[We give below a few of the more unusual poisoning cases that occurred during the year.]

Atropine.—In the district of Rangpur several cases of atropine poisoning occurred during the year. The civil surgeon of Rangpur sent the viscera of one man and vomited matter of nine persons, and the Superintendent of Police sent the suspected food and vomited matter for examination. It was reported that an unknown upcountry man administered poison to some coolies through food cooked by him and as a result one of them died. It was also said that he was suspected to be responsible for several other similar cases in this district as well as in the district of Purnea. The police recovered some brownish powdery substance from his person, which on examination was found to be broken pieces of datura seeds. At the post-mortem examination the viscera and the membrane of the brain was found congested. Atropine, the active principle of datura, was detected in the viscera and in the vomited matter.

The Civil Surgeon, Saran, Chapra, sent the vomited matter of several persons and some suspected substances (tari juice from date tree) for examination. It was reported that these men had been in the habit of stealing date juice for a long time and of drinking it. On the day of occurrence they stole the earthen pot in which the juice is collected from the tree and, some time after they had drunk the juice, symptoms of

poisoning developed and the villagers suspected that the owner of the tree being annoyed on account of the theft of tari might have put some poison in the pot. They all had typical symptoms of datura poisoning. On chemical examination atropine, its active principle, was detected in the date juice and in the vomited matter.

Arsenic.—The Civil Surgeon, Purnea, sent the viscera of a Hindu female, aged about 18, for examination. The deceased was said to have an illicit pregnancy for which she was reported to have been given root of cheeta and lime by mouth. She had several motions with blood and mucus and she died on the fifth day of her illness. On post-mortem examination the viscera were found decomposed. No opinion as to the cause of death was given by the Civil Surgeon. Arsenic was detected in the viscera by chemical examination.

The Deputy Magistrate, Contai, Midnapore, sent a small piece of bamboo stick with a lump of greyish-brown thick pasty substance attached to it, for examination. This was said to have been used as an abortion stick on a woman to cause miscarriage. By chemical examination arsenic was detected in the pasty substance.

The Subdivisional Officer, Jalpaiguri, sent a quantity of rice and some earth mixed with vomited matter for examination. It was said that a Mohammedan woman administered poison with rice to her husband. One day the complainant asked his wife for rice which she gave and on asking for more he was given rice again which tasted bitter. He felt a sharp pain in the chest and began to vomit after taking two morsels of rice. He noticed a kind of white powder mixed with the rice. He was advised by the neighbours to take some raw fish juice mixed with curd and water to promote vomiting and he was saved. Arsenic was detected by chemical examination both in the rice and in the earth mixed with the vomited matter.

Lead and opium as cattle poison.—The Subdivisional Officer, Netrakona, Mymensingh, sent a quantity of yellowish powder and a small lump of blackish pasty substance for examination to ascertain if they contained any poison for killing cattle. They were said to have been recovered from a *muchi*. On chemical examination the yellow powder was found to be oxide of lead, and opium was detected in the blackish pasty substance.

Perforation of stomach in a case of burns.—(1) The Coroner of Calcutta sent the viscera of a Hindu female for examination. It was reported that one evening, while the deceased was cooking food, her clothes caught fire and she was admitted into the hospital with extensive burns all over her body. At the post-mortem examination, the fundus and left half of the stomach was missing as if melted away, left side of diaphragm was also missing, left pleural cavity contained blood-stained fluid mixed with shreds of fatty tissues. Spleen was coloured black, lying loose in its bed, upper surface of the liver congested, margins discoloured, kidneys congested, upper surface of left kidney coloured black. No poison was detected in the viscera by chemical examination.

(2) The Coroner of Calcutta sent the viscera of a Hindu female for examination. It was reported that the deceased was boiling milk one evening for her newborn baby when her sari caught fire and she had extensive burns and died in hospital the same night. At the post-mortem examinations portions of the left half of the stomach were found missing at two places as if melted away, the adjacent parts were bluish in colour, mucous membranes decomposed. Left side of diaphragm also missing like the stomach. The brain, and its membranes, the kidneys and lungs were congested. No poison was detected in the viscera by chemical examination.

Though no poison was detected in either of the two cases noted, the object of reporting them is that auto-digestion of the stomach wall of such a degree in cases of burns has rarely been recorded.

Poisoning of fish by indigenous plants.—The Public Analyst of Assam sent a sample of a plant stem with a

few leaves from the Divisional Forest Officer, Nowgong, for examination in order to ascertain if it contained any active poisonous principle for killing fish. It was said that only the juice of the plant was used in the water to poison fish. The plant is known as 'Khariu' in Khasi and Jaintia Hills and also as 'Latabish'. Active principle could not be isolated from the sample sent but it was found that when a small quantity of aqueous or alcoholic extract was added to the water it killed the fresh-water fishes invariably within half an hour or so. It had, however, no action on warm-blooded animals, such as cats. Neither the watery nor the alcoholic extract when given to a cat produced any symptoms of poisoning. The Curator of the Royal Botanical Gardens, Calcutta, could not identify the plant from the sample sent as it was dry and very small. It is known that though fish poisoning is rare in India, the fruits or leaves of *Cocculus indicus* are used both in India and England for poisoning fish and picrotoxin, the active principle of the plant, acts as the poison.

Correspondence

INJURIES OF THE SKULL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—With reference to the codicil consisting of your note and the notes of an honorary visiting surgeon of the Calcutta Medical College Hospital which you were so good as to publish with my paper on injuries to the skull in your issue of March last, I shall be much obliged if you do me the favour of publishing this letter as an explication.

The notes on head injuries contributed by the junior visiting surgeon fairly represent British and Indian medical school teaching.

My paper is intended to be a challenge to such teaching. I cannot imagine a surgeon inspired with the views put forward in those notes operating until after the patient is dead in the case of fractures of the vertex. Such men wait for something favourable to turn up. If the patient dies the coroner is told that he died of fracture of the skull; that is all he requires, in case the patient lives for a year and a day as this amount of time liquidates a charge of murder. But he sometimes recovers partially and has mental and other nervous symptoms later from what the surgical press call 'encysted clot'—a very serious condition—the result of fracture of the vertex. The result of removing this clot is extremely bad, whereas all would probably have gone well if it had been removed immediately after the injury. So much for the junior visiting surgeon's notes.

The Editor assumes that I do not study papers and give them full weight. In this he is quite wrong—such papers on this most reactionary section of surgery are mostly traditional dross. What appears in the coroner's court is the class of information forthcoming in the motor accident cases to which Mr. Editor refers. The medical witness is very rarely submitted to a gruelling cross examination in the higher courts, as these are very seldom murder cases. It is enough for the coroner's court to give the cause of death as fracture of the skull. I quote two such cases which came to my notice:—

(*The Times*.) 'Captain C. P. Allen of the R.A.M.C. at Bovington Camp said that Mr. Shaw (Lawrence of Arab fame) and Mr. Hargreaves were admitted to the hospital between 11-30 and 11-45 a.m. Mr. Hargreaves was not seriously hurt. He had Mr. Shaw's skull x-rayed and this showed a fracture. Mr. Shaw remained unconscious until his death. He carried out a post mortem in conjunction with Mr. H. W. B. Cairns, the specialist of the London Hospital. This revealed that Mr. Shaw had a large fissured fracture nine inches long

extending from the left side of the head backwards. There was also a small fracture of the left orbital plate.

The brain was very severely lacerated especially in the left temple. The cause of death was fracture of the skull with severe cerebral damage, heart failure and congestion of the lungs. If he had lived he would have been unable to speak, he would have lost his memory and he would have been paralysed'.

(2) Another motor cycle accident. Coroner's inquest.

'Dr. T. S. Cochrane said the deceased was unconscious when he was admitted and never completely recovered consciousness. He had a fracture of the jaw and although an x-ray revealed no fracture of the skull witness was of opinion that there was a fracture of the base. Death was due to concussion and intracranial hæmorrhage'.

The evidence necessary in both cases was as much as was sufficient for the coroner's court to bring a verdict. Mr. Shaw lived over five days.

The other case lived fourteen days, both unconscious. There is no indication that either of these cases were submitted to an exploratory operation for hæmorrhage between the dura mater and the skull and the reports lead me to think that no such operation was performed. Mr. Shaw's skull was stated to have had a fissured fracture but there is no mention of hæmorrhage beneath that fracture. In the other case there was hæmorrhage but no mention of a fracture in the post-mortem report. Intracranial hæmorrhage without a fracture in an adult in my experience hardly ever occurs. In the first case a long fissured fracture of the vertex hardly ever occurs in my experience without a hæmorrhage between the dura mater and the skull.

Also I do not understand how severe laceration of the brain can occur in a case of fissured fracture. Mr. Editor would have me learn much from such cases. They are typical. I must admit that I am unable to learn anything from such reports beyond the fact that a government medico-legal expert should perform all post mortems which come before the coroner's court and that such reports should be published in full. This large mass of valuable material to us surgeons which is now useless would then become very valuable indeed.

I do not agree with the Editor that heterodoxies are a bar to progress. The reverse is the case; all progress in surgery has commenced as heterodoxy and has had to war against tradition.

Mr. Editor objects to me not using gloves in the case in question. Gloves are very useful in surgery and especially in post mortems but I do not make a fetish of gloves in cases like this in which the unblunted sense of touch is essential.

Yours, etc.,
HENRY SMITH, C.I.E.,
LIEUTENANT-COLONEL, I.M.S. (Retd.)

SIDCUP,
9th June, 1936.

[Note.—We have re-read Colonel Smith's paper and our own note very carefully and we cannot see how Colonel Smith can accuse us of suggesting that heterodoxies are a bar to progress.

We entirely agree with Colonel Smith that heterodoxies are an essential feature of a progressive science; it is from the heterodoxies of yesterday that the orthodoxies of to-day are formed. The words to which we took exception were 'I go my own way uninfluenced by any authority'. If everyone followed this precept surely science would cease to advance. We cannot each one start building from the foundations; we must build from where the last man left off, more or less, even if we disapprove of the way he laid the last few bricks and decide to relay them. Otherwise, a science would never advance beyond the point to which one single individual was able to take it. On the other hand, we would not advocate slavish submission to authority; this is equally sterilizing. Had we been of this frame of mind we should never have published Colonel Smith's stimulating paper.—EDITOR. I. M. G.]

Service Notes

APPOINTMENTS AND TRANSFERS

THE services of Major G. R. Oberoi are placed permanently at the disposal of the Government of the United Provinces, with effect from the 15th February, 1935, for employment in the United Provinces Jail Department.

Major R. Linton made over medical charge of the Dacca Central Jail to Dr. Profulla Prasun Choudhury on the afternoon of the 31st May, 1936.

The services of Captain C. C. Kapila are placed temporarily at the disposal of the Government of Burma, with effect from the 3rd June, 1936.

Captain E. H. Lossing is appointed as Civil Surgeon, Burdwan, until further orders.

Captain M. Jafar, Officiating Assistant Director, King Institute of Preventive Medicine, Guindy, is placed on foreign service under the Indian Research Fund Association, with effect from the date on which he assumes charge of his office.

The undermentioned officers are restored to the establishment :—

1st May, 1936

Lieutenant G. R. C. Palmer.

Lieutenant J. Revans.

Lieutenant T. Sommerville.

The undermentioned appointments are made:—

To be Lieutenants (on probation)

1st May, 1936

Andrew Copland Taylor.

Eric Norman Brockway.

Leslie Samuel Forder Woodhead.

James Gibb Thomson.

James Ronald Kerr.

Laurence Murray Kelly.

Kenneth Iain Eachain Macleod.

PROMOTIONS

Majors to be Lieutenant-Colonels

P. A. Dargon. Dated 12th May, 1936.

B. Sahai. Dated 21st May, 1936.

L. Blake. Dated 22nd May, 1936.

The seniority of Lieutenant (on probation) J. Revans is antedated to the 1st May, 1935.

RELINQUISHMENT

Lieutenant J. M. F. Byrnes relinquishes his probationary appointment, 5th May, 1936.

Notes

SPRULAC.

In a paper read before the Royal Society of Tropical Medicine and Hygiene, Dr. N. Hamilton Fairley reported on the treatment of sprue by sprulac. Some of his conclusions are given below:—

This powder has been specially prepared so that the ratios of protein: fat: carbohydrate = 1.0 : 0.3 : 1.3.

Though the alimentary features are not always as dramatically relieved as with a high meat protein, low fat, low carbohydrate diet, the end results have been uniformly satisfactory in all cases.

Provided adequate quantities of liver extract are administered blood restoration proves equally rapid whether a high milk protein or a high meat protein dietary is adopted.

Sprulac should have a special field of usefulness in the tropics where good quality meat in a satisfactory condition is often unprocurable, and where milk owing to its high fat and bacterial content frequently proves an unsuitable diet for sprue cases.

STELLIDIN

STELLIDIN (May and Baker) is a 4 per cent aqueous solution of histidine monohydrochloride intended for the treatment of gastric and duodenal ulcer. A course consists of about 21 intramuscular and subcutaneous injections given daily. This is followed by a rest period of six weeks and a second series of injections with the object of preventing possible relapse. In stellidin we have a new form of therapy based on rational application of experimental findings. It produces early and marked symptomatic improvement and cure in many cases of peptic ulcer.

Enquiries are invited by Messrs. May and Baker (India), Ltd., 11, Clive Street.

'PRONTOSIL'

CHEMOTHERAPY in protozoal infections has been so successful that a similar achievement in bacterial infections was in earnest demand. 'Prontosil' which is issued from the 'Bayer' laboratories in Elberfeld is claimed to be such a chemotherapeutic. It has been found suitable in the treatment of all streptococcal infections, such as erysipelas, carbuncles, tonsillitis, puerperal septicæmia, etc., and to a certain extent in staphylococcal affections.

'Prontosil' is available in the form of tablets and ampoules. The ampoules are administered intramuscularly.

Numerous clinical experiences have already been carried out and show that at least one of the most common bacterial infections can now be tackled confidently.

Messrs. Haverro Trading Co., Ltd., P. O. Box 642, Bombay, the agents in India of the manufacturers, may be approached for further details.

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Communications for the Publishers relating to Subscriptions and Advertisements should be addressed to THE PUBLISHERS, *The Indian Medical Gazette*, P. O. Box No. 54, Calcutta.

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Original Articles

EXPERIENCE WITH CANCER OF THE LARYNX, PHARYNX AND THE ADJOINING REGIONS

By V. M. KAIKINI, B.A., F.R.C.S. (Edin.)

Honorary Surgeon, King Edward Memorial Hospital,
Bombay

CANCER of the larynx is comparatively a rare disease. Out of a hundred deaths due to cancer, twenty-one, on an average, are caused by cancer of the stomach, while only 1.8 are due to laryngeal cancer. Laryngeal carcinoma is a very painful disease and, in untreated cases, the lot of the patient is very distressing, pain combined with dyspnoea and dysphagia makes the end extremely miserable. Cancer is a curable disease provided it is tackled early by the surgeon; and this maxim holds good in the case of cancer of the larynx. Even in advanced cases where permanent cure is out of the question, it is found that radical removal of the primary malignant growth gives immense relief to the patient, especially as regards pain and other discomfort for the remainder of his short existence; for even if secondaries occur which prove fatal, they do not give rise to pain, as in the case of primary tumour, and death is comparatively painless and less miserable.

Cancer of the larynx can be classified in the following four groups:—

(1) *Intrinsic cancer*.—In this are included growths starting from the vocal cords, the ventricles, the ventricular bands or the inter-arytenoid regions.

(2) *Sub-glottic cancer*.—This originates on the inner or the under surface of the vocal cords or the sub-glottic area.

(3) *Extrinsic cancer*.—This group includes cancer growing from the epiglottis, the aryepiglottic folds, the arytenoids, the pyriform sinuses, and the pharyngeal surface of the cricoid cartilage (cricoid cancer).

(4) *Mixed*.—This includes cases which are a combination of extrinsic and intrinsic and are only seen in an advanced stage, so that it is difficult to determine the site of origin.

Extrinsic cancer is a serious disease because the glands are affected at an early period, its course is rapid and it is seldom cured by operation.

Intrinsic cancer on the other hand is a comparatively benign form of malignant disease in its early period. At first it grows slowly and does not infiltrate rapidly. So long as the disease is limited to the vocal cords it does not affect the lymphatic glands.

Carcinoma arising on a vocal cord or in the sub-glottic region is almost always a squamous-celled epithelioma, but occasionally it may be a basal-celled carcinoma which closely resembles

an endothelioma. In the basal-celled carcinoma there is but little tendency to recurrence after removal, whereas in endothelioma the liability to recurrence is greater.

Glandular involvement is late in intrinsic carcinoma of the larynx. When the tumour extends beyond the arytenoid region the lymphatic area of the pharynx is reached, so that in these circumstances not only are the lymphatic glands along the internal jugular veins invaded by cancer cells, but the pharyngeal mucous membrane in the immediate vicinity has a pseudo-cedematous appearance which is characteristic of early malignant invasion, even though it may appear to be free from disease microscopically.

According to Soerensen a small group of lymphatic glands lying under the upper edge of the isthmus of the thyroid gland is early invaded in carcinoma of the larynx. This explains some unexpected recurrences in the stump of the trachea after laryngectomy (as happened in one of my cases mentioned below) even when a generous margin of healthy mucous membrane has been allowed between the lower edge of the growth and the incision.

The epitheliomas originating in the epiglottis are of relatively low malignancy. Lymphatic glands are not involved until the growth has spread either on the base of the tongue or to the aryepiglottic fold.

Intrinsic cancer almost invariably attacks one vocal cord and may take months or even years until it has spread to a dangerous extent.

Sub-glottic cancer may be met with in three different positions:

(1) Intrinsic cancers originating on the upper surface or still more commonly on the free margin of the cord may extend by dipping downwards along the inner surface.

(2) The intrinsic neoplasm may originate on the inner or under surface of the cord but below its free edge.

(3) The cancer may arise below and quite distinctly from the cord sometimes as low as the cricoid ring and always in the anterior half of the larynx.

Symptoms and signs

Intrinsic cancer.—In no other internal region of the body does cancer give such an early warning of its occurrence as in the cavity of the larynx.

The first and for a long time the earliest sign is hoarseness which is persistent and progressive. For many months there is no pain, cough or dysphagia. In later stages, on account of the narrowing of the glottis due to the spread of the disease, the hoarse voice becomes almost inaudible and dyspnoea and stridor develop. Later on, the cartilages may be involved and also the other structures. Death results from cachexia or septic pneumonia.

In cancer starting from the ventricular bands or originating in the ventricle of Morgagni the symptoms are still late in developing.

Sub-glottic cancer.—The first early symptoms are local discomfort, difficulty in getting rid of an increasing amount of secretion and dysphagia. The symptoms of intrinsic cancer are chiefly concerned with voice and respiration, while those of extrinsic cancer are primarily concerned with deglutition. Later on there is pain, generally unilateral, radiating to the jaw or ear on the same side and increased on swallowing. Sometimes there is no pain or discomfort, especially when the growth is on the epiglottis or the aryepiglottic fold, and the first sign may be the enlargement of a gland in the neck. It runs a rapid course and many patients succumb within a year of the first manifestation of the disease.

Mixed intrinsic and extrinsic cancer.—The symptoms are a combination of the two varieties, extrinsic and intrinsic.

Diagnosis and prognosis

The unilateral character of any inflammation or infiltration is generally sufficient to exclude simple or catarrhal laryngitis. In cancer involving the vocal cord the patient speaks without pain in a rough but strong voice. In most of the tuberculous cases speech is fatiguing.

Below are given nine cases of cancer involving the larynx and the adjoining regions operated on in the King Edward Memorial Hospital, Bombay.

Braun's method of local anæsthesia was followed in which the cervical plexus is injected with novocain at the level of the transverse process of the third and fourth cervical vertebræ. A line is taken from the tip of the mastoid process to the sterno-clavicular joint. At the junction of its upper and middle thirds the posterior border of the sterno-mastoid muscle is pushed forward with the forefinger of the left hand and the transverse process of the fourth cervical vertebra is identified. The needle is introduced at this point to the depth of about one-and-a-half centimetres in a vertical rather than horizontal direction to avoid risk of injury to the vertebral artery. This renders the whole of the neck anæsthetic. In addition local infiltration with novocain was done in the superficial portion of the neck.

In all the cases of laryngectomy preliminary tracheotomy was done and except the first two cases all had a preliminary gastrostomy. It was found that introduction of a stomach tube through the mouth produced an excessive secretion of saliva, which later caused a good deal of sloughing of the wound. It was found that doing away with the stomach tube introduced through the mouth and feeding the patient through a gastrostomy wound lessened the amount of saliva secreted and the neck wound healed better.

Every patient had his teeth cleaned before the operation and in two cases where dental sepsis was advanced all the teeth were removed.

In these two cases the results of the operation were the best.

Technique of the operation

In only one case—the first—was the operation done in two stages according to the method described by Gordon New of the Mayo Clinic. In the first stage the hyoid bone was divided and the larynx and the two upper rings of the trachea were 'skeletonized' by retracting the prelaryngeal muscles and dividing the isthmus of the thyroid. Tracheotomy was done at the same time. After about ten days the larynx was removed under local anæsthesia. In other cases of laryngectomy the operation was done in one stage although tracheotomy was done about ten days before the main operation. The method followed was that of Gluck. Two horizontal incisions were made from the anterior border of one sternomastoid to the anterior border of the other, the first at the upper margin of the hyoid bone, the second at the lower border of the cricoid cartilage. These were joined by a median vertical incision. Two quadrilateral flaps thus formed were turned back one on either side. The pharyngeal muscles were exposed and retracted and the larynx was freed from the layers of muscles on its anterior aspect by dividing the sterno-hyoids and sterno-thyroids at their insertions on the thyroid cartilage. The upper lobe of the thyroid gland was separated and retracted downwards thus exposing the cricoids and the upper one or two rings of the trachea. The crico-thyroid artery on either side was ligatured and divided and the isthmus of the thyroid gland was pulled down. The larynx was then tilted to either side and the attachments of the inferior constrictor and stylo-pharyngeus to the larynx were divided close to their insertion. The thyroid cartilage was separated from the hyoid bone by cutting through the thyro-hyoid ligament.

The superior laryngeal vessels on either side were ligated and the superior laryngeal nerves divided. The thyroid cartilage was grasped at its angle by volsellum forceps and the larynx drawn forward, and the thyro-hyoid membrane divided on each side as far back as the cornu of the thyroid cartilage. The epiglottis was drawn forward and divided. The upper aperture of the larynx was thus exposed and a gauze packing was passed up into the pharynx to prevent the saliva from running down over the wound. A transverse incision was then made below and behind the arytenoids down to the cricoid cartilage and the mucous membrane of the hypo-pharynx was dissected out of each sinus pyriformis and from the back of the cricoid cartilage as far as its lower border. The larynx was then cut away from the trachea by incising the trachea just below the cricoid. In nearly all cases the upper opening of the divided trachea was closed with chromic catgut stitches and the patient allowed to breathe through the old tracheotomy opening. The opening in the pharynx was then closed and the skin incision

sutured over it with silkworm gut, and rubber drainage tubes were inserted in each corner of the incision.

Below is given the description of nine cases operated upon:

Case 1.—R. J. K., 10th December, 1931. Carcinoma larynx.

This was an advanced case of carcinoma involving both the vocal cords, the anterior commissure, the epiglottis, the pyriform fossæ, the hypo-pharynx and base of the tongue. The teeth were not removed nor was preliminary gastrostomy done; the case was too advanced for any such operation. A two-stage operation was done under local anesthesia. Post-operative shock was practically absent but otherwise the results were far from satisfactory. From the third day the wound started getting septic. There was a good deal of expectoration from the tracheotomy opening and gradually the whole wound gaped and started emitting a very foul odour. However, the general condition of the patient continued to be good, the fever never rising above 100.5°F. On the seventh day the patient was found to be getting up from the bed and going to the water-closet by himself. The wound was carefully cleaned every day and on the eighth it looked healthier. On the same day the patient pulled out the œsophageal tube, which was passed through his nose, and he got severe hæmorrhage from the pharyngeal vessels which stopped after reintroduction of the tube and packing of the wound. On the night of the ninth day the patient again pulled out the stomach tube, the hæmorrhage again started and, before the assistant could come to reintroduce the tube, the patient collapsed and died.

Case 2.—T. G., age 49.

The patient was admitted for carcinoma involving both the vocal cords and crossing below the anterior

All the teeth were removed about three weeks before the operation. The operation was done in December 1931, with a preliminary low tracheotomy. The



Fig. 2.—Case 2. About two months after operation. Tubal graft seen in the lower portion of the neck.



Fig. 1.—Case 2. Patient about four weeks after operation. A fairly big pharyngostome seen in the middle line of the neck.

commissure. The epiglottis was slightly involved and also a small portion of the hypo-pharynx.



Fig. 3.—Case 2. About three months after operation. Tubal graft seen at the upper portion of the neck which finally closed the pharyngostome.

larynx was removed in one stage according to Gluck's method with 'H'-shaped incision. A stomach tube

was kept inserted through the mouth and the dressings were changed twice daily. On the third day the temperature rose to 102°F. and the wound started leaking in the upper part. Gradually the wound got clean and started granulating, but a large pharyngostome was left behind. On account of the presence of the stomach tube in the mouth, a large amount of saliva was secreted and it leaked through the pharyngeal opening. The patient was getting greatly emaciated on account of the loss of saliva, so gastrostomy was done about the last week of January 1932 and the stomach tube removed. This reduced the amount of dribbling saliva and feeding was done through the gastrostomy tube. The patient gradually improved in health and the wound looked very healthy. Four plastic operations had to be done to close the pharyngostome completely. He was given an artificial larynx and was able to pronounce a few words fairly distinctly, but he



Fig. 4.—Case 2. Patient four years after operation of laryngectomy with the pharyngostome completely closed and much improved in health.

discarded it saying that it was uncomfortable. At present he is in fairly good health, free from recurrence and earning his livelihood as a street hawker.

Case 3.—G. K., age 40.

The patient was admitted for pain in the throat of over six months' duration. He gave a history of having swallowed a piece of bone some time before the pain started. No foreign body was detected. The larynx showed a growth on the right aspect of the laryngeal vestibule involving the right aryepiglottic fold on its pyriform aspect. The vocal cords were free. The patient refused operation. He came again after about five months as the trouble had grown worse and he had difficulty in breathing. The growth had completely involved the left pyriform fossa and aryepiglottic fold, infiltrating into the epiglottis beyond the middle line and tilting it. It was breaking down in places. The right vocal cord was fixed.

All the teeth were removed as they were septic. Tracheotomy was done on 17th September, 1932, as the patient complained of severe dyspnoea, and gastrostomy was done on 26th.

Complete laryngectomy was done on 11th October under local anaesthesia, according to Gluck's method. The wound practically healed by first intention and the

patient was discharged in good condition on 22nd November. He remained completely free from symptoms for about nine months. After that a carcinomatous ulcer appeared in the lower part of the wound just above the tracheal opening; this increased in size and the patient died of the secondary growth within a few weeks. This growth must have occurred in some of the lymphatic glands under the upper edge of the thyroid gland which, according to Soerensen, are involved in some rare cases.

Case 4.—A. M., age 40.

The patient was admitted for pain and difficulty in swallowing which gradually increased and he started getting paroxysms of coughing as the food reached the lower end of the pharynx. The difficulty was progressing. X-ray-barium meal was seen entering the trachea and bronchi. Laryngoscopy showed involvement of the fossae and also the upper portion of the oesophagus.

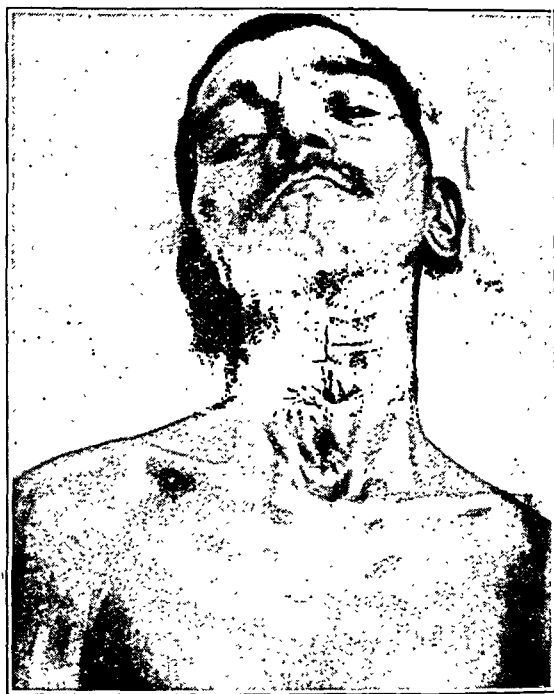


Fig. 5.—Case 3. Patient about one month after the operation of complete laryngectomy. The wound healed by first intention and no pharyngostome left behind.

The operation was done according to Gluck's method under local anaesthesia. A carcinomatous growth was found in the oesophagus extending from the level of the cricoid to about an inch below the level of the suprasternal notch. The trachea was also found invaded a little below the cricoid and on the right side the prevertebral muscles were also involved. The whole of the larynx was removed, the trachea being divided two inches below the cricoid. The oesophagus was separated from the surrounding tissues and pulled out as much as possible from the thorax and the portion affected by the tumour was resected. As the distal portion of the oesophagus receded into the thorax it was found that complete removal of the affected part had not been done and a small portion at the upper end looked suspicious. The disease had advanced to such an extent and as it was practically an inoperable case, further attempt was not made to do any intrathoracic operation. The upper portion of the wound was closed and the lower was left open and packed with mercurochrome gauze. The patient was fed through the gastrostomy opening, which was made some days before the final operation. He had very little post-operative shock; but he gradually developed

mediastinitis on the fourth day and died on the seventh day.

Case 5.—A. B.

The patient was admitted for an originally intrinsic cancer of the larynx which had later on become extrinsic by involving the pyriform fossæ. Gastrostomy and tracheotomy were done some days before the final operation. The method of operation was the same as in the previous cases except that the incision was V-shaped with the two arms of the 'V' beginning at the angle of the jaw and meeting just above the tracheotomy opening. The pharynx was found to be invaded by the tumour right up to and including the base of the tongue. On the left side the thyroid cartilage was invaded and the growth had involved the jugular vein also, and four or five cancerous glands were found in the vicinity. The larynx was removed along with the affected portion of the base of the tongue and also the cancerous gland. There was profuse bleeding in removing the branches of the internal jugular vein which had been invaded by the secondary growth. But the internal jugular was not excised. There was no appreciable post-operative shock and the patient seemed to be doing well. But on the fourth day he died suddenly, most probably from an embolus detached from the internal jugular vein. In this case, perhaps the patient's life would have been prolonged if the affected portion of the jugular vein had been completely excised.

Case 6.—K., age 20.

The patient was admitted for a carcinomatous growth of the pharynx involving the anterior, left-lateral and posterior walls and extending from the upper level of



Fig. 6.—Case 6. Patient one month after the operation of laryngectomy and pharyngectomy with a small pharyngeal fistula in the upper portion of the neck. Mark X shows the site of the oesophageal opening.

the pyriform fossa right down to the level of the cricoid cartilage. The left wall of the thyroid cartilage was involved and also the left vocal cord. The operation was done according to Gluck's method. The larynx was easily freed on the right side. But on the left side, the tissues were found to be very adherent to the lateral wall of the larynx, due to malignant infiltration extending from the pharynx. The larynx was completely removed. As the pharynx was extensively involved by the malignant growth practically the whole of it had

to be removed including some portion of the prevertebral muscles, which had been infiltrated by the growth. As the growth had advanced too far posteriorly it was found impossible to eradicate it completely. However as much as possible was removed leaving apparently a clean wound behind. The left skin-flap was used to cover the raw surface left by the removal of the posterior pharyngeal wall and the right flap was brought over it, thus making an attempt to construct an artificial pharynx. The mucous membrane left at

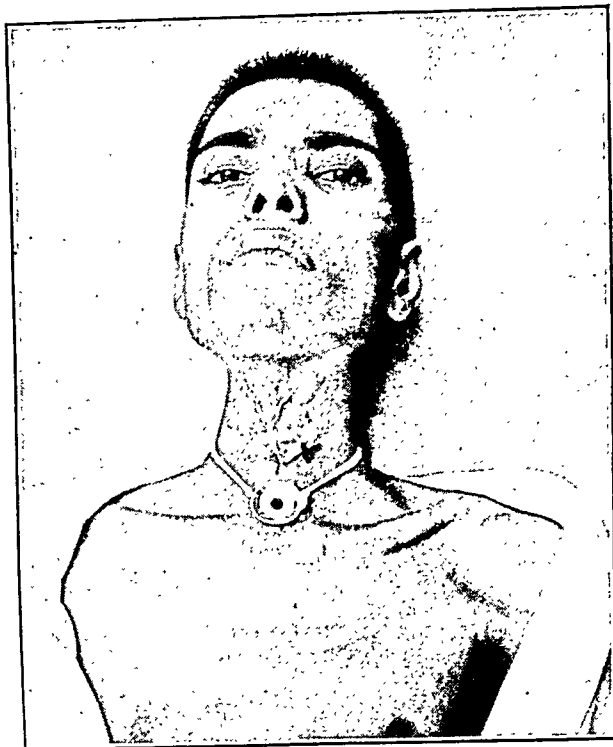


Fig. 7.—Case 6. Patient about two months after the operation for complete laryngectomy and pharyngectomy. The pharyngeal fistula has completely healed. Mark X shows the site of the oesophageal opening in the neck.

the upper portion of the pharynx was brought together and closed by a few sutures but the skin could not be brought together to cover it up, so that portion was left open and packed with mercurochrome gauze. A stomach tube was inserted through the opening in the oesophagus in the lower portion of the neck, as the gastrostomy opening was not functioning properly. The wound progressed well and by frequent changing of the dressing it was kept healthy, but the anterior flap of the artificial pharynx did not hold and the opening at the upper portion of the pharynx gaped. The condition of the patient improved very much. He was cheerful, the pain in the throat and neck having completely disappeared after removal of the malignant growth. The wound granulated nicely and looked very healthy and the pharyngeal fistula closed. The patient was given radium exposures. However, after about five months the oesophageal opening was found to be getting gradually narrowed, due to secondary cancerous growth developing there. The growth extended to the tracheal opening and the patient eventually died of inanition about six months after the operation.

Case 7.—S. V. K., age 67.

The patient was admitted for pain in the throat aggravated by swallowing and radiating to the right ear. Examination showed a carcinomatous ulcer involving the epiglottis, posterior third of tongue, valleculæ and right wall of the pharynx.

The cervical plexus was blocked according to the method given above and novocain was injected

through the base of the tongue. A median incision was made from the symphysis menti to a little below the hyoid bone. The muscles were separated and the pharyngeal mucous membrane was exposed. The hyoid bone was divided in the middle line. The epiglottis, which was completely involved, was detached by being divided at the base. The whole of the base and about one-third of the posterior portion of the tongue were excised with scissors. This gave rise to a little bleeding. A big carcinomatous ulcer was found occupying the right wall of the pharynx extending to the inner surface of the thyroid cartilage and as the condition of the patient was not good enough to stand such a formidable operation, nothing further was done and the wound was closed in layers with a drainage tube inserted.

The patient felt free from pain after the operation and was looking very comfortable. He was discharged a month later, the wound having healed completely except for a small sinus where the drainage tube was inserted. Swallowing was painless. He was advised deep x-ray for his lateral pharyngeal tumour. Nothing further was heard about him.

Case 8.—N. V., age 70.

The patient was admitted for pain on left side of the mouth radiating to the ear for the past month, with difficulty in swallowing. On examination a small cauliflower-like growth was found on the left tonsil involving the anterior pillar of the fauces, and the adjoining portion of the tongue. The operation was done under local anaesthesia, novocain being injected in both the pterygo-mandibular fossae and in the base of the tongue. A little local infiltration had to be done round about the tonsil as the patient complained of some pain there while cutting the mucous membrane. The left cheek was split with scissors from the left angle of the mouth to the anterior margin of the masseter muscle. The left half of the tongue, the tonsil and the affected portion of the pillar and soft palate were excised with scissors and knife. The tonsil was first separated superficially with scissors from the surrounding mucous membrane and then enucleated by means of the fingers. It came out very easily as the malignancy had not invaded the lateral wall of the pharynx. The incision in the cheek was stitched. The patient did not suffer from any shock.

Block-dissection of the glands in the neck was done on the left side. The patient was discharged in good condition.

Case 9.—A. P. P.

The patient was admitted for cancerous growth of the posterior third of the tongue involving the epiglottis and the vallecular fossae on 8th September. But he went home and did not return till December 1935, when the growth was much bigger and had involved the floor of the mouth and the submaxillary glands.

The teeth were removed on the left side as they were found to be septic and tracheotomy was done thirteen days before the operation. Anaesthesia was induced by injecting novocain into both the pterygo-mandibular fossae and by blocking the cervical plexus on both sides of the neck. At first the left half of the tongue, which seemed to be affected more than the right, was removed as completely as possible through the mouth. Next transhyoid pharyngotomy was done by making a vertical incision from the symphysis menti to half an inch below the hyoid bone, and dividing the hyoid bone with bone-pliers. The pharynx was opened and the lower air-passage blocked with gauze packing to prevent blood going into the trachea. Through this opening, the posterior third of the tongue and the epiglottis were removed and as much as possible of the affected tissues in the vallecular fossae and the floor of the mouth. However the tumour seemed to have involved the surrounding area very extensively and it was not possible to see if all the malignant tissue was removed. The tracheotomy tube was removed 17 days later and the patient was discharged with a small fistula in the middle of the wound in apparently good condition. He

(Continued at foot of next column)

INFANTILE ECZEMA

By GANAPATI PANJA, M.B. (Cal.), D.B. (Lond.)

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INFANTILE ECZEMA is a distinct clinical entity. The disease is comparatively common in Calcutta and the writer has come across many cases in hospital as well as in private practice. The affection is very chronic and obstinate. Mothers of affected children are put to a great deal of inconvenience and anxiety.

Ætiology.—About 250 cases have been seen, of which 30 have been studied in detail with the object of working out the ætiology. The lesion starts usually in the first year of life, but the age incidence varies from the third month to the fifth year. Both males and females suffer almost equally and all races are equally susceptible to the disease. Children of well-to-do parents living under good hygienic conditions are as prone to the disease as the children of the poor. The affection may occur throughout the year but is more frequent in the winter months and in some years the disease appears to be seen more frequently than in others.

Almost all the children studied were fed with cow's milk, the majority being over-fed. Some of the children were on a mixed diet. A cutaneous milk test employing adequate controls was performed. Parke Davis and Co.'s

(Continued from previous column)

was seen about a month later. His fistula had healed and he was feeling much better and could swallow fairly well.

Conclusion

All the cases reported here were very advanced ones. Even case 2, who is still alive four years after the operation, was an advanced one for a successful operation. Some of the cases were really inoperable. But these apparently inoperable cases, although they were in agony before the operation, were very much relieved afterwards and death, which came to them a few months later, was comparatively a comfortable and painless one. Death appeared to be mostly due to inanition, and was not the lingering and torturing death which overtakes unoperated cases of carcinoma of the larynx.

So far radium and x-rays have not been found to do any permanent good to laryngeal carcinoma.

In extrinsic carcinoma of the larynx, operative treatment combined with radium or x-rays may give very good results.

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extract of cow's milk was employed for this test. Of 21 cases on whom a milk test was done, 17 gave a positive reaction. In other words, about 80 per cent of the cases were sensitive to cow's milk. Gray has mentioned that eczematous children often give positive cutaneous reactions to various proteins and therefore the test in his opinion is useless. I have not been able to confirm this, for out of 21 cases four gave a negative reaction. Positive reactions have all been generally moderate.

The lesion by itself is not contagious. Nursing mothers are not affected and the affection does not generally spread from one child to another in the same family. Ill health does not seem to be an important predisposing cause. No correlation of the disease with the diet of the mother was detected.

The blood shows a leucocytosis in every case and the eosinophiles are increased in a number of cases, being from 10 to even 60 per cent. Average percentage of eosinophiles is about 15 per cent and five cases have not shown any eosinophilia at all. Some abnormality has been found in the stools of almost all the cases. Samples from 25 cases were examined and the following results obtained:—

Giardia cysts	..	3
Charcot-Leyden crystals	..	7
<i>Streptococcus hæmolyticus</i>	or	
<i>viridans</i>	..	6
Enterococcus	..	8

Pus cells, hookworm and ascaris ova, *Bact. pseudocarinatus*, *Bact. morganii*, *Bact. asiaticus*, *Bact. faecalis alkaligenes* and *Proteus vulgaris* were found in some samples.

When contrasted with the results of the examination of stools of hospital cases and other healthy individuals these findings appear to me to be definitely abnormal. Further, it must be remembered that only one sample from each of the above 25 cases was available and if more samples had been examined it would have been possible to see whether the same findings were obtained on repeated examinations. Killed suspensions of streptococci and enterococci isolated from the stools were tested on patients' skins, but no positive reactions were seen. The importance of such a dermal test is illustrated in the following case of adult eczema. The patient was suffering from dyspepsia, occasional bronchitis and eczema. His stool on repeated examinations showed *Bact. cloacæ* and *Bact. morganii* in each sample. A dermal test was done with these two organisms and a marked positive reaction was obtained. A control test with *Bact. coli* was negative. An autogenous vaccine of these two organisms was prepared and given. The patient's improvement was considerable and he was free from dyspepsia, bronchitis and eczema.

The view that infantile eczema is seborrhœic in origin and the scalp is the starting point

could not be corroborated. Scrapings from the lesions and the scalp of 23 cases were examined microscopically with great care, but no spores of Malassez were found. On culturing the scales according to my method (Panja, 1927) in three cases only was the culture positive. As spores of Malassez are so frequent on the human skin, this small percentage of positive culture can be ignored. It is interesting to note here that although a culture was positive in three cases, microscopical examination of scales was negative.

Of the three positive cases, the disease was present on the scalp alone in one and in the others the scalp as well as the body were affected. These three cases were probably seborrhœic in origin. As regards other micro-organisms, no fungi were found; *Staphylococcus albus* and sometimes *aureus* were isolated from many of the cases. In some cases, particularly those with secondary impetigo or ecthyma, streptococci were frequently isolated. Parakeratosis, pus cells and morococci were seen.

In a certain number of cases the eczema started soon after vaccination and it is conceivable that in some way the vaccine lymph sensitizes the skin and predisposes to the lesion. Over- or under-feeding of babies and mother's improper diet are regarded in the textbooks as causes of the lesion but no proof in support of these statements could be obtained. In certain cases, carefully observed by me at my own house, forced feeding with cow's milk generally aggravated the condition or brought on a fresh attack. Reduction in the number of feeds, administration of a mixed diet with vegetables, fruit juice and poached eggs brought about distinct amelioration of the condition. The quality and composition of cow's milk may play an important part in the disease.

It has been suggested that the products of certain plants, when ingested by cows, pass into their milk and when this milk is taken by certain children, these products act as antigens and give rise to infantile allergic eczema. Towle and Talbot hold that eczema is due to mal-assimilation of fats and carbohydrates and they have found eczema frequently associated with fat indigestion and sugar intolerance, but I have not found these disturbances in this series of cases. It has also been stated that if mothers take plenty of eggs during pregnancy, their children are liable to infantile eczema. I have not been able to find any truth in this theory.

Unna has assigned three causes for infantile eczema, namely, nervous, tuberculous and seborrhœic. He held that the eczema that occurs during the dentition period is nervous in origin; those associated with scrofula and rhinitis are tuberculous and the rest starting from the scalp and caused by his 'flaschen' or 'bottle bacilli' (spores of Malassez) are seborrhœic. In most of the cases studied here, disorders of dentition, scrofula, rhinitis and

seborrhœa of the scalp were not seen. In only one out of 30 cases was the scalp alone affected and cultural examination for the bottle bacilli was positive, but not the microscopical. This may be Unna's seborrhœic type. In the majority of my cases eczema started first on the lower legs. Further it is frequently seen that a seborrhœic lesion, if of long duration, sensitizes the skin and gives rise to typical infantile eczema on the face and on other parts of the body surface.

A few years ago several British dermatologists held that infantile eczema was mainly due to an external irritation of the sensitive infantile skin by clothes, changes of temperature, diet, sweat, etc. (Gray, 1926). I have not been able to corroborate this. The causes mentioned above are not the main causes, but rather exciting factors. The conclusion is that the eczema is mainly due to an internal cause. The child's skin gets sensitized to an antigen which may be endogenous in the bowel or exogenous in the food, or both. This conclusion is based on the frequent absence of correlation between the lesion and the external factors and presence of milk sensitiveness, abnormal blood and bowel conditions and the results of clinical tests. I have seen a mother taking almost equal care of all her children regarding external factors such as baths, clothing, cleanliness and exposure, and still one is affected with eczema while others have escaped.

Varieties, signs and symptoms

(1) The first type is *seborrhœic eczema*. The term 'seborrhœa' means a fatty hyper-secretion which pours out from skin glands and thus



Seborrhœic infantile eczema.

renders the soil suitable for growth of 'bottle bacilli', staphylococci, etc. This variety starts invariably on the scalp and is often confined to this region. It is characterized by œdema, scaliness, hyper-secretion, formation of crusts, and secondary infection with staphylococci and sometimes with streptococci. A secondary impetigo occurs in many cases. There is loss of hairs in patches. On examination of the dry scales, spores of Malassez, cocci and pus cells are found. If the lesion spreads downwards, the upper part of the body is more liable to be affected than the lower part and, if a child suffers for a long time, the whole skin-surface may become sensitized and generalized eczema supervene.

(2) The second type is *true infantile (allergic) eczema* and is more frequent in this country. It is characterized by erythematous, papular, squamous and lichenified lesions. The face and legs are the two important sites of predilection. Besides the face and legs, the scalp and sometimes the whole body may be affected. In many cases the thighs and legs are



True infantile eczema.

affected first, and in some cases the legs alone are involved and other parts of the body escape altogether. In some cases, the scalp is not affected and this may serve to distinguish it from the seborrhœic type.

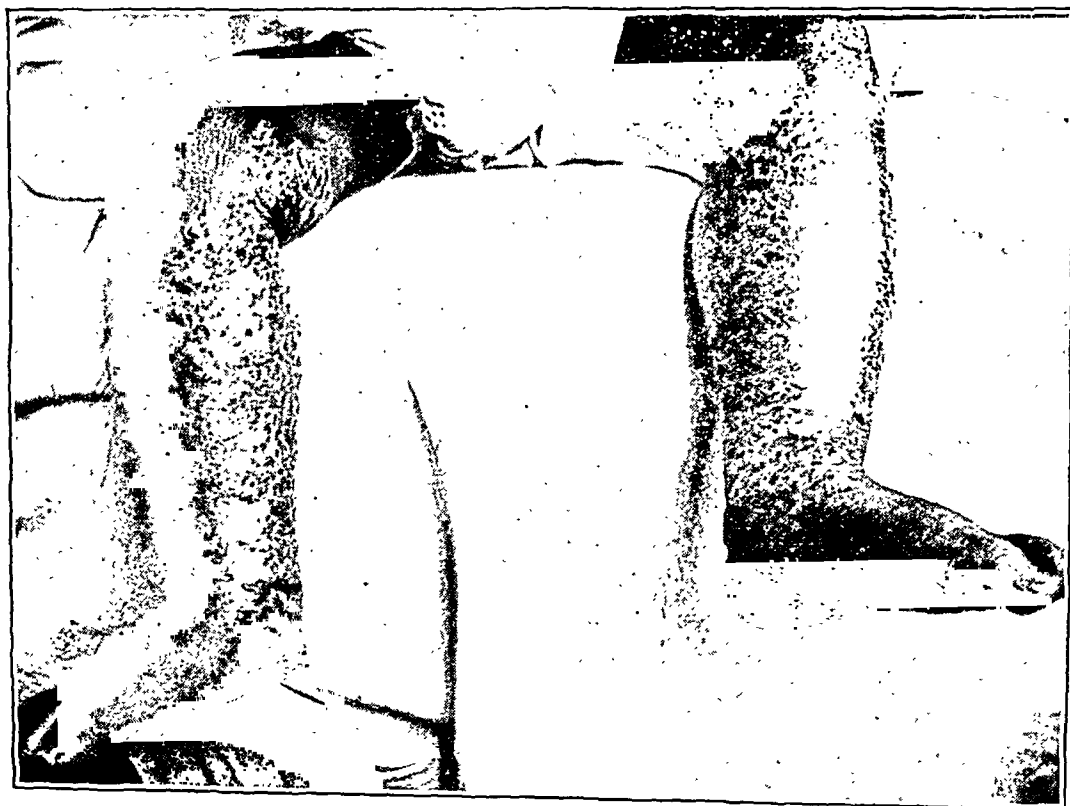
In cases where the scalp is affected, in order to arrive at a definite diagnosis of the type, it must be decided whether the scalp is affected first, simultaneously, or subsequently, and scales from the scalp must be examined microscopically and by culture for spores of Malassez. Sometimes both types are found in one and the same case. At first, tiny erythematous patches are seen, more often on the cheeks and legs. Sometimes erythematous patches are transient in nature and then the papular lesions develop.

The next stage, which in typical eczema is vesicular, is not commonly seen. The papulo-squamous stage is the outstanding feature in most cases. Severe itching is always present and invariably on account of this secondary infection develops, resulting in impetigo, boils, etc. Sometimes scabies gets associated with the eczema and the child's condition then becomes miserable. When the lesions dry up, lichenification showing thickening, lines, fissures and scaliness is seen and itching becomes intolerable. Neither the child nor the anxious parents can get any sleep. Relapses are frequent in this disease and form a characteristic feature as in other allergic conditions, such as asthma and urticaria.

(3) *Hebra's prurigo*.—In this disease, the extensor aspects of the extremities are mainly affected; the face and scalp usually escape. Lesions are usually multifiform and secondary infections are not common. Thickening and pigmentation are often seen.

(4) *Papular urticaria*.—This is generally seen in infants under two years of age and is characterized by reddish blotches and central dark-red papules commonly appearing on the buttocks and thighs, whereas infantile eczema generally affects the face and legs, and the papules are not dark red.

(5) *Congenital syphilis*.—This is distinguished by other signs of syphilis, history of the disease in parents, absence of characteristic



'True infantile eczema.

Differential diagnosis.—The disease must be distinguished from the following :—

(1) *Impetigo contagiosa*.—In impetigo, flaccid vesicles containing sero-pus and yellowish crusts are characteristic. The disease rapidly yields to dilute ammoniated mercury ointment containing 10 grains to an ounce. It must also be remembered that impetigo may supervene on infantile eczema.

(2) *Scabies*.—This is sometimes associated with eczema. Scabies is characterized by its contagiousness, presence of the lesions between fingers and in the groin as a rule and usual absence on the face, and marked itching which is worse at night. It yields readily to treatment with sulphur.

relapses, freedom from itching and ready response to antisyphilitic measures.

Complications.—Organisms of leprosy, in this country, and tuberculosis may gain access to the body through an eczematous skin. I have seen several cases where leprosy has started after a prolonged attack of eczematous skin lesions. In this country, where leprosy is so common it is very important not to neglect chronic eczema in children. Emaciation and broncho-pneumonia may set in. Nephritis has been seen to occur in some cases. Secondary impetigo is common. Enlargement of lymphatic glands and abscesses may occur.

Prognosis.—This is better in the seborrhoeic type. In the true infantile allergic type, cure

takes place, if properly treated, for a prolonged period.

Treatment.—There is a common belief in this country that it is inadvisable to cure eczema in infants, as it is said that by so doing the disease will be 'driven in' and complications are likely to ensue. Once a quack practitioner suggested that the infant's eczema was due to the curing of the mother's eczema while the child was *in utero*. Such a theory of course has no scientific foundation. I only draw attention to it because it is generally believed. A child suffering from eczema should not be left untreated. It must have internal as well as external treatment to ensure a radical cure and, if the patient is properly looked after, there is no fear of complications setting in.

Treatment

(1) *General measures.*—Exposure to wind and bright sun, irritating medicated soaps, vigorous rubbing and uncleanness must be avoided. Heavy, unclean and tight clothing are inadvisable and constipation should be corrected.

(2) *Diet.*—This must be carefully regulated. Cow's milk is better given in minimal quantities or omitted altogether and to prevent the formation of thick clots lime water should be added to the milk. The cow's milk may be replaced by goat's milk or patent milk foods. If the child is taking other articles of diet besides milk, then one article of diet after another should be omitted for a few days, to see whether the patient is sensitive to any of them. Once the real offending agent is detected, it must be strictly avoided. The number of feeds should be reduced. Over-feeding must be corrected but the patient should receive adequate nourishment. Excessive fat in the diet should be avoided. A mixed diet, green vegetables, oranges and pomegranate juice have been found suitable. The mother's food should also be scrutinized in cases of breast-fed children; hot curries, excessive meat, fish and eggs are harmful to the eczema of breast-fed children.

(3) *External treatment.*—Itching must be relieved. Scratching must be obviated as far as possible by tying the hands to the bed or covering them with thick, soft pads or by means of suitable cardboard splints.

A useful external treatment for both the types is as follows :—

(a) Early in the morning, warm olive oil or coco-nut oil with a little camphor is applied and this is kept on for about two to four hours. This softens the scales, soothes the skin and itching. The following combination has been found very useful :—

Olive oil	..	..	4 oz.
Camphor	..	..	$\frac{1}{2}$ dr.
Gaultheria oil	..	..	30 drops.
Creosote	..	..	5 drops.
Citronella oil	..	..	2 fluid drachms.

(b) Then a warm bath or, in case the child is running a temperature, a tepid sponging is given. Soaps except bland soaps are better avoided, as these tend to irritate the skin. Sponging with a weak lysol lotion (15 to 20 drops to a pint of warm water) is very effective in relieving itching. Inflamed and irritable surfaces may be fomented with this lotion. In fact, hot compresses with weak lysol lotion have been found by me to be an excellent remedy in relieving itching and this has been amply corroborated by others.

(c) After the skin surface has thus been prepared, one of the following applications should be used :—

(i) If there is acute dry inflammation, then the surface should be painted with silver nitrate (2 per cent) lotion followed by a cold cream consisting of lanolin 10 parts, benzoated lard 20 parts, rose water 30 parts, or calamine liniment consisting of the following :—

Zinc oxide	..	..	gr. 15
Calamine	..	..	gr. 15
Carbolic acid, liquid	..	..	3 drops
Almond oil	..	..	$\frac{1}{2}$ oz.
Lime water	..	..	$\frac{1}{2}$ oz.

(ii) If there is acute moist inflammation, the surface should be painted with gentian violet (5 per cent in 20 per cent alcohol) lotion and about one to two hours later compound calamine lotion or zinc oxide paste should be applied to the surface. Sometimes, though not commonly, aluminium acetate lotion works better than calamine. Success depends on the continuous application of the lotions. The following formulæ for the lotions and the paste have been found satisfactory after several trials. The reaction of the lotions must approximate to that of the normal skin.

Lotions—

(1) R Calaminæ preparatæ	..	5ii
Zinci oxidi	..	5ii
Liquoris plumbi fortis	..	m xv
Liquoris carbonis detergentis	..	m xv
Glycerini	..	5ii
Aquam calcis	..	ad 5ii
(2) R Aluminii sulphatis	..	230 gr
Plumbi acetatis	..	130 gr
Aquæ destillatæ	..	5ii

Paste—

R Zinci oxidi	..	5ii
Liquoris plumbi fortis	..	m xv
Liquoris carbonis detergentis	..	m xv
Olei olivæ	..	5ii
Paraffini mollis alb.	..	5i

In a few days, œdema, oozing and pustules subside. If there is much weeping and a secondary streptococcal infection, a piece of absorbent lint soaked in acriflavine lotion (1 in 5,000) is a very valuable remedy. Acriflavine applied in this way for four to six hours destroys micro-organisms, keeps the surface clean and acts as a sedative astringent. It may be applied during the day and the paste at night.

(iii) If the inflammation is subacute, calamine lotion should be applied. Certain sensitive skins do not tolerate calamine lotion. Calamine liniment is to be preferred in these cases.

(iv) If there is secondary impetigo, the most valuable remedy after the bath or sponging is dilute ammoniated mercury ointment gr. v or x to an ounce of white vaseline. In a day or two, all crusts and scabs disappear and the eczematous area becomes dry and clean.

(v) If there is secondary, pustular folliculitis, painting with gentian violet lotion is excellent. Experimentally gentian violet has been found to kill staphylococci and inhibit the growth of streptococci and fungi.

(vi) When the lesion is chronic and indolent, a tar paste consisting of

Crude coal tar	..	..	2 dr.
Zinc oxide	..	..	2 dr.
Lanolin	..	..	$\frac{1}{2}$ oz.
White vaseline	..	..	$\frac{1}{2}$ oz.
Liquid paraffin	..	..	2 dr.

and about 10 to 15 exposures of sub-erythematous doses of ultra-violet light from a quartz-mercury-vapour lamp are valuable remedies. If possible, ultra-violet rays should be applied twice a week or daily in every case of infantile eczema from the beginning. I do not know of any other agent so valuable in curing the disease in such a short time and preventing relapses as the ultra-violet-light bath. Counter-irritant and destructive doses must be avoided. The light bath acts as a tonic, raises the calcium content of the skin, stimulates absorption of exudates, helps to destroy the superficial staphylococci which are always present and locally acts as a valuable antipruritic agent. Unfiltered x-rays have also been applied to relieve pruritus with marked success. For localized chronic lesions, I should always advise x-rays when other measures have failed.

I have seen indigenous treatment with sandal paste or paste made with margosa leaves and turmeric sometimes useful. This acts as an antiseptic and sedative to the skin and protects it from the injurious influences of the external atmosphere and dust.

(4) *Internal treatment.*—(a) The following powder is useful :—

R Hydrargyri cum creta	..	gr. $\frac{1}{2}$
Pulveris ipecacuanæ	..	gr. $\frac{1}{12}$
Peptalminæ magnesii	..	gr. i
Saccharini lactis	..	gr. ii

To be taken three or four times daily, 1 to 2 hours after meals.

(b) A powder consisting of calcium gluconate, parathyroid, thyroid and powdered glucose is sometimes useful. According to Barber, glucose acts as a stimulant to the liver and increases its detoxicating function. Calcium with

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ENTERIC FEVER IN VIZAGAPATAM

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ENTERIC fever was never absent from Vizagapatam for more than two months at a time during the five years ending December 1935 and never more than seven months in all out of the sixty, as revealed from the results of the Widal test done for the local K. G. Hospital. Ignorance, deplorably inadequate soil and personal sanitation, an intermittent and partially-protected or unprotected water supply, lack of protection of food supply and the prevalence of certain tropical features such as swarms of flies during the greater part of the year, are, as in other places, responsible for this endemic persistence. Enteric fevers in this place are divided between the typhoid and the paratyphoid A infections. No positive case of para B or C has been met with during the last ten years of this laboratory. Inferentially they do not exist here. Of the first two, typhoid is easily the predominating infection. A table of analysis of the tests done is given below. It shows that in 1931 and 1935 para A evinced a

(Continued from previous column)

parathyroid diminishes sensitiveness and erythema of the skin and its proneness to infection. Thyroid increases the defence of the body.

(c) Sulphur internally, antimonial wine, arsenic and vitamins have all been tried and found sometimes useful. I prescribe some vitamin preparations as a routine. Weakly anæmic children should have tonics consisting of iron, hæmoglobin, nux vomica and calcium.

(d) For sleep, bromide and chloral should be given. By inducing sleep, not only is itching relieved, but indirectly the child's general condition also improves.

(e) Injection of foreign proteins, such as milk or peptone, have sometimes been found to act like a charm, especially in those sensitive to milk. Soamin has been tried with variable results. Children with high eosinophilia have responded well to soamin. In obstinate cases, intramuscular injections of the child's own blood or blood from a healthy individual should be given a trial.

In one of my obstinate cases, an autogenous vaccine prepared from enterococci isolated from the patient's stool was the final treatment given to effect a cure.

A child with infantile eczema improves as a rule when taken to a healthy climate. Hence a change should generally be advised if a month's careful treatment fails to give lasting benefit.

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greater frequency than usual, and tended to show a periodicity. All cases diagnosed clinically occurring in Vizagapatam are not corroborated by this test as a fair proportion of them are treated at home where the test is rarely done. As a routine the macroscopic method is the one followed in this laboratory using formalized and standardized broth cultures of the organisms as antigen.

Those epidemiological conditions that govern the relative incidence of these infections have been little studied. Both these diseases manifest

and the individual resistance may be other contributory factors in the establishment of sub-infection. The presence of a large number of carriers in a closely herded community cannot also be ignored in this connection. The longer a disease remains in a locality the greater is the endemic immunity developed among the population against that disease, which consequently does not always breed true to type.

Cases of enteric begin to increase in June, reach the maximum in August and diminish towards the end of November thus covering a

TABLE

An analysis of the Widal tests done in this laboratory for the last five years

	Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
Positive for <i>B. typhosus</i> .	1931	0	3	4	2	0	3	5	16	3	4	3	4	47
	1932	5	6	2	1	2	1	7	10	5	4	2	2	47
	1933	1	3	5	0	0	5	4	9	6	3	4	4	44
	1934	2	1	4	3	4	4	1	13	5	10	2	0	49
	1935	0	0	0	4	1	0	1	11	6	15	8	1	47
	TOTAL.	8	13	15	10	7	13	18	59	25	36	19	11	234
Positive for <i>B. para A.</i>	1931	0	0	1	2	0	3	1	3	3	1	3	2	19
	1932	1	0	0	0	0	0	0	2	2	0	3	0	8
	1933	0	0	1	0	0	0	1	1	0	0	3	0	6
	1934	1	1	0	1	0	0	0	2	0	0	1	0	6
	1935	1	0	0	0	2	1	1	1	1	4	5	1	17
	TOTAL.	3	1	2	3	2	4	3	9	6	5	15	3	56
Negative both for <i>B. typhosus</i> and <i>B. para A.</i>	1931	9	9	5	7	11	8	6	15	7	6	6	5	94
	1932	4	5	8	5	10	8	3	12	6	3	6	2	72
	1933	3	5	5	2	2	7	9	12	10	9	3	5	72
	1934	4	9	4	7	11	13	10	15	9	17	6	9	114
	1935	10	7	5	14	5	12	7	7	12	13	10	7	109
	TOTAL.	30	35	27	35	39	48	35	61	44	48	31	28	461
TOTAL	1931	9	12	10	11	11	14	12	34	13	11	12	11	160
	1932	10	11	10	6	12	9	10	24	13	7	11	4	127
	1933	4	8	11	2	2	12	14	22	16	12	10	9	122
	1934	7	11	8	11	15	17	11	30	14	27	9	9	169
	1935	11	7	5	18	8	13	9	19	19	32	23	9	173
	TOTAL.	41	49	44	48	48	65	56	129	75	89	65	42	751

great variations from the textbook types in their clinical course often misleading the physician and giving him considerable difficulty in diagnosis pending the result of the Widal reaction. Filth, close aggregation and ignorance concerning personal sanitation favour the occurrence of a slow immunizing sub-infection, which probably plays an important rôle in the genesis of such atypical cases. Attenuation of the virulence of the organism, the infecting dose

period of five months. Of these, the three months August, September and October form the quarter of highest prevalence exceeding in total that of the remaining nine months. The time of onset, the peak and the decline of the diseases are greatly influenced by the time of onset and the amount and duration of the monsoon. An early or late onset of the latter also determines a corresponding change in the time of recrudescence of the diseases. Another link

of importance influencing it is the fly curve, which in its turn also depends largely upon the rains. Close aggregation necessitated by the rainy months and early cold season may also help as subsidiary factors in determining the period of maximum prevalence.

A considerable number of cases of long continuous fever, in certain aspects simulating enteric but differing from it in having slight leucocytosis, rapid pulse even from the very beginning and repeated negative Widal, come up for diagnosis towards the decline of the enteric season and during the lag period. There are reasons to suspect that some of these cases may be of typhus and in any event it is essential to work out their cause. Very recently it was decided to do the Weil-Felix reaction on all the Widal negative specimens to elucidate this point. The macroscopic procedure was adopted as in the Widal test, employing the OX19 and the OXK strains of *B. proteus* kindly supplied by Prof. Kingsbury of Kuala Lumpur. Alcoholic suspensions from plain agar prepared as described in *The System of Bacteriology* (Medical Research Council) was used as antigen. Formolized (0.2 per cent) broth cultures were also included in the test but they were found to be much less sensitive than the alcoholic suspensions. Out of 20 sera tested so far one gave positive reaction against OXK in 1 in 640 and another in 1 in 320. Although the results cannot be considered to have clarified the issue on account of the small number of cases investigated, they point to the necessity of further investigation in this field. It is hoped to pursue this work as opportunities arise. In this connection it is interesting to note that when the writer was taking blood for culture from a suspected enteric patient a tick was noticed hanging from the left side of the chest. It was found on examination to be a hard tick and as the significance of a tick-bite in the causation of typhus was little appreciated at that time, nothing further was done. The patient had a sharp rise of temperature from the beginning, the characteristic temperature pulse correlation of typhoid was absent, he had slight leucocytosis instead of leucopænia and an enlarged spleen but no rash. The blood culture was negative and the Widal also twice negative. The temperature touched normal on the nineteenth day and he had an uninterrupted convalescence. The association of a tick in this case may have been fortuitous and in the absence of further confirmatory findings it can only be taken at best to be a case of suspected typhus. But it was this observation that suggested later the possibility of the existence of some form of the non-epidemic type of typhus in Vizagapatam.

I take this opportunity to express my thanks to Dr. A. Neave Kingsbury of Kuala Lumpur for the strain of proteus and for the Annual Reports of that Institute and to Dr. C. Ramamurti, Professor of Bacteriology in the Medical College, for his valuable suggestions.

VACCINE TREATMENT OF TYPHOID

By C. KRISHNASWAMY RAU, B.A., M.B., B.S. (Mad.),
M.R.C.S. (Eng.), M.R.C.P. (Lond.)

and

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Introduction

As early as 1913 the workers Frankell, Ichikawa and Thirolix issued reports upon the successful treatment of typhoid fever by the intravenous injection of typhoid bacilli vaccines. Recently, non-specific protein shock therapy has been tried with benefit in many acute and chronic infective conditions. The question of treating typhoid fever with injection of proteins and specific and non-specific vaccines has been taken up by many clinicians and observations and reports are published from time to time in the literature. Price, in the *Lancet* for December 1934, quotes the results of Uroiste of Montevideo and Stejskal of Vienna. These workers used carefully-standardized triple typhoid vaccine intravenously, to produce the shock. Triple vaccine, by virtue of its specificity, produces a more defined and uniform reaction than other foreign proteins or non-specific vaccines. Being impressed by the successful results obtained by the above workers, we have treated, since June 1935, almost every case of typhoid fever which has come to the Krishnarajendra Hospital with triple vaccine.

The advantages of this method of treatment are :—

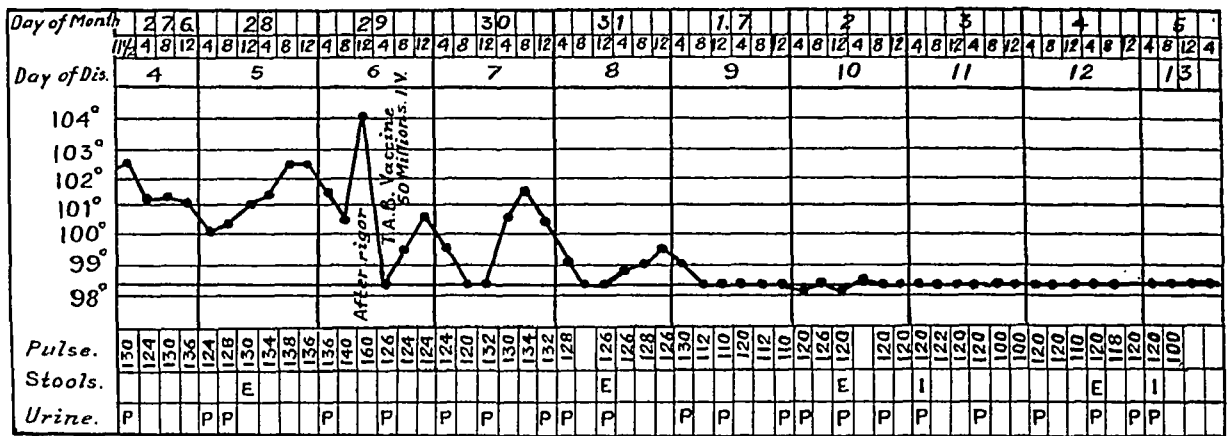
1. That it aborts the disease before the patient reaches the stage where there is danger of perforation or hæmorrhage, and before there is marked loss of weight, vitality and strength.
2. That it prevents relapses and sequelæ.
3. That it enables a more liberal diet to be given even during the pyrexial stage.

It has been claimed that these ideal results can be obtained when the patient comes for treatment early, preferably in the first week, or at any rate not later than the second week. Our observations also confirm this statement.

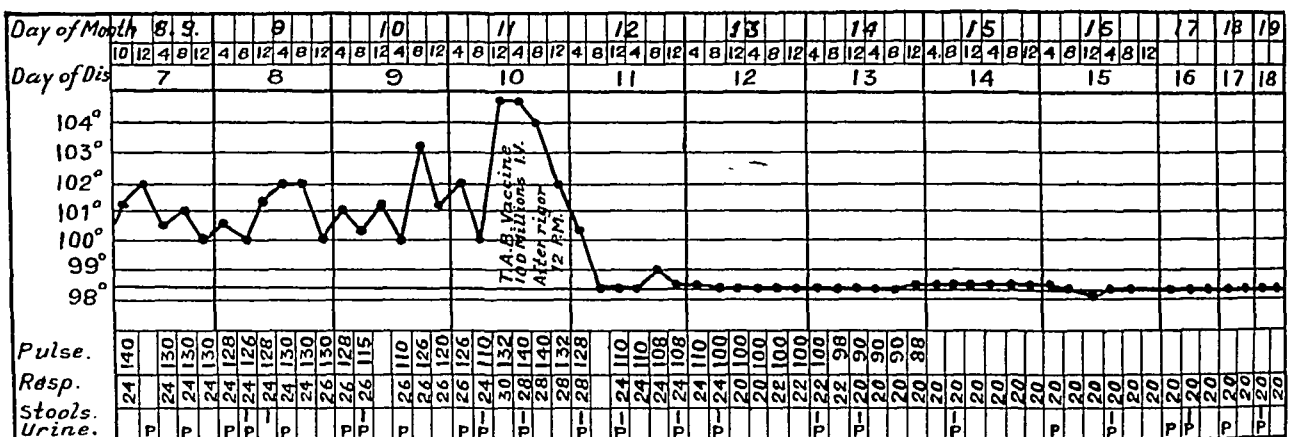
Mode of administration.—Administration of vaccine by the intravenous route is most effective in producing the required degree of shock. We have recorded as high as 84 per cent success in cases where intravenous triple vaccine was started in the first week of illness. On the other hand in late second week cases, when the patient is in a state of toxæmia with signs of toxic myocarditis, we hesitate to give triple vaccine intravenously for the obvious reason that the shock produced might be followed by unfavourable results. In such cases we prefer giving the vaccine intramuscularly; some respond well, others do not show much reaction. This explains the lower percentage of success in our series of second week cases. Thus triple

patient and brings about a modification in the range of temperature, though it may not cut short the course of the fever in all cases.

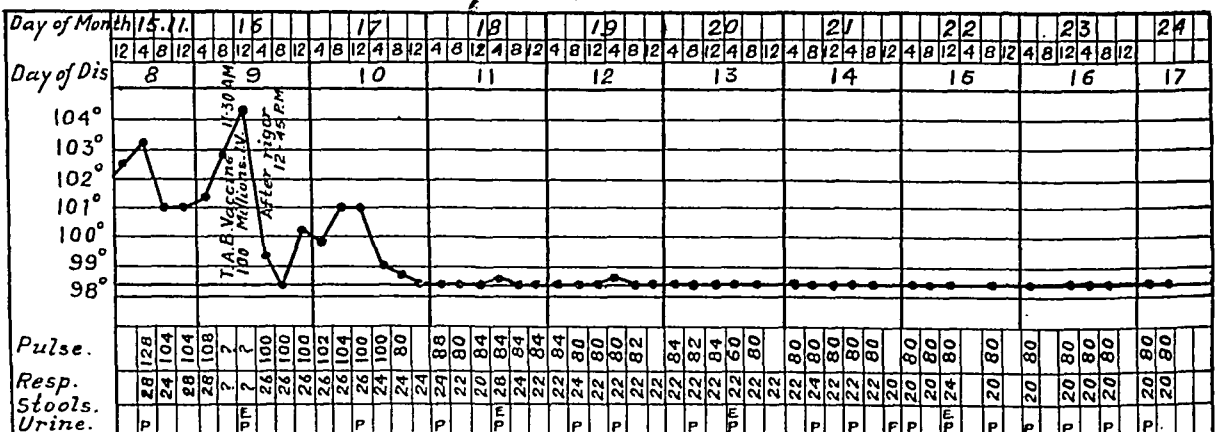
Age... 6 years.



Age ... 16 years.



Age... 14 years.



Dosage.—The average adult dose given in our series of cases varied from 50 to 100 million

organisms intravenously and 100 to 200 million organisms intramuscularly. Estimating that the potency of a given batch of vaccine had diminished, we gave 300 million organisms intramuscularly to two different cases without untoward effect though the temperature shot up to 106°F. The dose usually employed in children between eight and twelve years of age is 50 million organisms intravenously. The dose and the route of administration have to be determined in each case by taking into consideration the degree of toxæmia, the day of the disease, the condition of the myocardium, the temperature, the age and the general condition of the patient.

Reaction.—Typhoid vaccine injection is generally followed in about half an hour by a severe rigor which lasts for about twenty minutes to an hour, and it may be necessary to treat this condition by hot drinks, blankets, hot-water bottles, etc. As the chill subsides there is a definite rise of temperature which reaches its maximum in about two to four hours. This reaction temperature may vary from 102°F. to 104°F. In our series of cases 106°F. was the maximum temperature following the intravenous injection of 300 million organisms in the triple vaccine. Temperature elevation persists for twelve to twenty-four hours after which it usually drops abruptly, and is accompanied by profuse sweating. It should be remembered that the patient has to be carefully watched during this stage of reaction. Some observers have noticed a state of depression during this period; the temperature falling below normal, the volume of the pulse being reduced considerably and becoming rapid. Under such circumstances fifty cubic centimetres of a 50 per cent glucose solution given intravenously with 1/30th grain of strychnine are advocated to combat the collapse. In our series of fifty-five cases we have had no occasion to resort to this measure.

One striking feature that is observed in almost all cases treated with the triple typhoid vaccine is the remarkable change in the general appearance of the patient. Within twenty-four to forty-eight hours the patient has a clear face, cheerful look and bright eyes. The tongue becomes moist and clean, appetite returns, and above all the patient himself expresses a feeling of well-being and freshness. This is in marked contrast to an average typhoid patient, with dull eyes, heavy look, flushed cheeks, dry-coated tongue, headache and low muttering delirium.

Laboratory findings

(1) We find in cases so treated there is definite leucocytosis. According to Stejskal, this is a sign of good response and means an improvement in the condition of the patient.

(2) The blood and stool cultures become rapidly negative.

(3) The agglutination test becomes strongly positive if formerly negative, and stronger if it had been weakly positive.

(4) The anti-bodies appear much earlier and also are more active.

In this connection it seems probable that the danger of the spread of infection through carriers is also lessened.

This report is based on the observations of fifty-five cases treated with triple typhoid vaccine from June 1935 to December 1935. The diagnosis in all cases reported in this paper was confirmed by blood culture or Widal test, and in some instances by both, before commencing treatment. A few case reports, illustrating the typical reaction that follows intravenous or intramuscular triple typhoid vaccine, are appended.

Case 1.—A child, aged 6 years, was admitted on 27th July with a history of continuous fever for five days. Blood was sent on the 28th for culture and showed a positive growth of typhoid and paratyphoid A. Fifty million organisms of triple vaccine were given on the 29th. The temperature shot up to 104°F., then dropped to normal the same evening, but showed a little rise the next day. It returned to normal on the 31st of July and there was no further rise. The patient was discharged on the 12th day of the disease.

Case 2.—A female patient, aged 16 years, was admitted to the hospital on 8th September at 8 p.m. with a history of continuous fever for seven days. The blood was sent for a Widal test on the 10th September and found to be positive in all dilutions. One hundred million organisms of triple typhoid vaccine were given intravenously on the 11th at 11-30 a.m. This was followed by a rigor at 12 noon, the temperature reaching its maximum of 105°F. at 4 o'clock that afternoon. By 8 o'clock the next morning the temperature had dropped to normal and remained normal for the rest of her stay in the hospital.

Case 3.—A girl of 18 years was admitted to the hospital on 15th November with a history of continuous fever for eight days and a temperature ranging between 101°F. and 103°F. On the same day the blood was sent for a Widal test and was found to be positive in all dilutions. On 16th November, 100 million organisms of triple typhoid vaccine were given intravenously at 11-30 a.m. and at 11-45 she had a severe rigor, the temperature rising to 104°F. by 12 noon. It dropped to normal on the same night at 8 o'clock. The next day (the 17th) there was a slight rise to about 100°F., but the temperature returned to normal that evening, and there was no subsequent rise. The patient remarked the day after her injection, 'Thank you Doctor, I am all right now. When shall I go home?' Such a sense of well-being is rarely found in the usual run of patients ill with enteric fever in the second week of the disease!

From the above case reports it will be seen that within 36 hours of giving the vaccine treatment it was possible to declare these patients well on the way to recovery, as shown by the absence of temperature and rapid return to normal health. To complete the course of treatment it is advisable to give a second injection of the vaccine intravenously followed by one or two intramuscular doses at intervals of two or three days. When no definite leucocytosis results from the triple vaccine injections other proteins such as milk or omnadin are recommended.

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SODIUM MANDELATE IN THE TREATMENT OF *BACILLUS COLI* INFECTION

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IN Bengal, coliform infection frequently occurs after abortion in women. Ordinarily, *Bacillus coli* escape from the large intestine, their normal habitat, in diseases of the bowels in which the natural immunity is disturbed by removal of mucus and damage to the mucous membrane of the intestinal wall, by dysentery or diarrhoea, or by violent purgatives. The lymphoid tissues of the small intestines and lymphoid glands round the ileo-colic veins afford further protection against coliform infection. The urinary tract is specially liable to be

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Statistics of cases treated with triple typhoid vaccine from July to December 1935

Week	Number of cases treated	Number of cases which responded	Percentage of successful results
Early ..	7	6	84
First ..	14	10	70
Second ..	27	13	42
Third ..	7	All cases ran their usual course with no complication.	..

Conclusion.—The intravenous route in selected cases yields the best results. In the majority of our successful cases, one intravenous injection has been sufficient to bring down the temperature; rarely two were required. The earlier the case the better is the response to this mode of treatment. Even in the *mofussil*, where laboratory equipment is inadequate, this mode of treatment can be carried out as it is usually possible to diagnose a case as typhoid even before the second week by the clinical signs and symptoms alone, particularly when there is an epidemic, and with certainty if there is a case of continuous fever in a house in which there has already been a case of typhoid.

The vaccine employed was obtained from the Public Health Laboratory, Bangalore. We thank Dr. Natarajan, the Director, for his promptness in sending supplies. We also wish to express our thanks to Dr. J. F. Robinson, the medical officer of the Krishnarajendra Hospital, Mysore, for his help in the preparation of this paper. It was he who urged our adoption of the vaccine treatment and the administration of liberal diet in typhoid fever, based upon his successful experience of twenty years with this method.

attacked by *B. coli*, resulting in pyelitis or cystitis, if by any means the natural immunity of the intestinal walls is removed. The frequency of coliform infection after the puerperium, miscarriages and abortions may be due either to direct infection of the uterus through the vagina, or to urinary stasis on account of pressure of the gravid uterus on the urinary passages. Less frequently *B. coli* escapes into the blood stream from sensitized intestines, either directly or through the lymphatics, the gall-bladder and urinary bladder are then secondarily affected.

Cholecystic troubles are also more frequent in females than in males in this country and a large proportion of them are due to coliform infection. Interference with the drainage of the gall-bladder is an important factor in favouring its infection.

The habits and peculiar condition of women make them more liable to disorders of the bowels. Chronic constipation, visceroptosis, colitis and chronic diarrhoea remove the natural barrier to passage of *B. coli* from the large intestine to the interior of the body, as suggested by Besredka. The presence of a septic focus or septic foci in some part of the body is also a predisposing factor to coliform infection, hence a considerable number of cases give a history of some trouble such as chronic appendicitis, cholecystitis, or salpingitis.

Diagnosis.—In many cases more than one culture of urine is necessary to obtain positive results, and better results are obtained if the sample of urine is collected during the actual attack of rigor at the onset of fever.

Treatment.—The treatment of *B. coli* infection was formerly confined to strong alkalis and urinary and biliary antiseptics. Of the latter, various preparations, such as hexamine, hexylresorcinol, urotropine and pyridium, were largely employed, but the results were not always satisfactory. The alkalis are sometimes effective in reducing the temperature, but the effect is usually temporary. Any drug producing a strong acid reaction of the contents of the bladder hinders the growth of the organism. Acid sodium phosphate, which is usually given with hexamine in coliform infections, favours not only the production of the antiseptic formaldehyde in the system, but directly hinders the growth by increasing hydrogen-ion concentration of the urine. It was also found that to make hexylresorcinol effective the urine should not be made alkaline. The success of Helmholtz and Clark's ketogenic diet was attributed, however, to the special action of 1- β -oxybutyric acid as well as the reduced pH value. The drawback of these treatments is that they take a long time to produce the desired results and frequently are ineffective.

The introduction of mandelic acid in the treatment of coliform infection of the urinary tract has been a great advance as no more than

five days' treatment is necessary for making the urine sterile. The following case notes have been selected to illustrate some of the points discussed in this article.

Case 1.—U., female, was admitted into the Eden Hospital with history of abortion of a four months' foetus, six days previously. She had been running an irregular temperature with chill and rigor for the last two months. Some blood clot and a mass of placental tissue with hydatiform mole were removed from the uterus and the bleeding stopped. Patient was very anemic and run down. Lochial discharge was present. Blood was sent for Widal's test on the 12th February, and the serum agglutinated against *B. typhosus* in 1 in 250 dilution. On the following day, the 13th February, she was transferred to the Medical College Hospital and her temperature was found to fluctuate between 100° to 104.6°F. Urine was sent for culture on the 15th February and *B. coli* was found in it. On the 18th February, the patient was given a strong alkaline mixture which gradually brought down the temperature to normal by the 22nd February. This was followed by urotropine and acid sodium phosphate (10 grains each, three times a day). An autovaccine was also prepared and the first dose, containing 5 millions of the organisms, was given on the 23rd February. The vaccine was repeated every 4th day, in gradually increasing doses, 10, 20, 30 and 40 millions of *B. coli*, and the last dose was repeated every 7th day. *B. coli* was however persistently present in the urine. On 4th March, she again had a rise in temperature which persisted in remittent form till the 12th but was eventually brought under control by administration of large doses of alkalies. The autovaccine was continued systematically. As *B. coli* were still present in the urine, ketogenic diet, as recommended by Helmholtz and Clark, was tried, but the patient could not bear it; it had to be stopped as she developed nausea and diarrhoea. Lastly, it was decided to give a trial to mandelic acid. Accordingly, 15-grain capsules of ammonium chloride was given four times for two days (31st March and 1st April). On the 2nd April, the reaction of the urine became strongly acid and a mixture containing 52 grains of sodium mandelate, two drams of syrup of lemon and an ounce of water was given four times daily, for five days. The urine became sterile from the 5th April. Since then repeated culture of urine showed negative results. The patient's pulse and respiration, which were 80 and 20, respectively, remained unaltered during the administration of mandelate. The patient was discharged cured on the 15th April.

Case 2.—P., female, aged 18 years, was admitted into the Eden Hospital for treatment of abortion after carrying four months. The patient gave a history of fever, but after abortion the patient's temperature came down to normal on the 2nd April, but rose again on the 4th April, after which she was transferred to the Medical College Hospital. The temperature however again came down to normal on the 5th. Blood sent for Widal's test against the enteric group showed T(H) + + + + +. On the 7th, a catheter specimen of urine was sent for culture. On the 8th, a report was received that the culture was positive for *B. coli*. She was immediately put on ammonium chloride gr. 15, four times daily for two days. On the 10th April, her urine became strongly acid, and sodium mandelate (52 grs. four times daily) was given for five consecutive days. The samples of urine examined on the 11th and 12th April showed *B. coli* but on the 14th the urine was found to be sterile, though pus cells and epithelial cells were still present. The cultures of urine passed on succeeding days were also sterile. No untoward result was recorded and no signs of acidosis were manifested during administration of sodium mandelate. The respiration rate which was 22 per minute went down to 20 per minute, but the pulse rate went down from 90 to 64 and the patient did not

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X-RAY APPEARANCES SEEN 24 YEARS AFTER HEALING IN A CASE OF EXTENSIVE TUBERCULOSIS OF LUNG

By RAI G. C. CHATTERJEE, BAHADUR, M.B.,
F.R.I. (Lond.)

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UNIMPEACHABLE evidence of real healing of pulmonary tuberculosis strengthens the physician's hands in persisting unwaveringly, during the active period of the disease, in following a rational line of treatment, undisturbed by doubts which often arise in his mind or that of the patient or his relatives, whether it will lead to success by making him an absolutely healthy man. This is one of my reasons for publishing a further account of this case treated in the year 1912, detailed report of which has been published so far back as 1914 (July issue, *Indian Medical Gazette*). The second reason is to apply to this case the up-to-date method of detection of lung lesions, namely x-ray, not available then, to find how much of the cicatrix left after healing in 1912 noticed then, remains after a symptomless, healthy interval of as long a period as 24 years, in a case the detailed report of which is available for comparison. This is available to any one of the present readers of this case report, if he looks through the old files of the *Indian Medical Gazette*.

The writer, for the sake of convenience, is putting down here, first, a synopsis of notes of the case, culled from the above published detailed report, and then the description of the present condition of the case. Before doing so, it is necessary to mention here the occasion which necessitated examination of the case at the present time. The gentleman, who is a highly educated and successful professional man, practising in one of the district towns, came to Calcutta on 25th April, 1936, for some private business and he paid a visit to me, but not to consult me about any complaint connected even remotely with his old disease. I took the opportunity for examining him thoroughly, comparing his present physical signs with those to be found in the already published report of the case, and then he was taken to the x-ray room, and examined critically both by fluoroscopy and by taking of a film in order to find out any remnant of the old lesion.

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complain of any subjective symptoms. She was discharged cured on the 20th April.

One interesting feature in these two cases was that in both the patients the Widal's test was positive, one against *B. typhosus* and the other against the flagellate antigen. It is possible that both these patients had suffered previously from enteric and that these findings were due to an anamnestic reaction.

Synopsis of the report of the case culled from the report published in the July 1914 issue of the Indian Medical Gazette :—

The patient, an adult male, aged 30, enjoying regular good health, began getting cough and fever from middle of February 1912. I saw him for the first time in June 1912. His condition was as follows—the patient though of strong build showed signs of marked emaciation. He had a troublesome cough with nummular expectoration. Microscopical examination showed numerous tubercle bacilli.

The physical signs gradually changed from moist râles to dry wheezing sounds which on deep breathing changed to creaking sounds. This condition remained for five years, i.e., these sounds could be heard, though he was in a perfect state of physiological balance, showing that these signs indicate that fibrosis had taken place.

After the course was finished in 1912 he went to Bhowali Sanatorium, then under the charge of Lieut.-Col. Cochrane, I.M.S., where he remained for eight months. There he took no



Shows several large calcified nodules and several small ones in the left apex—the seat of the old active lesion—first observed in 1912. The costal cartilages of the first rib on both sides are ossified on account of age.

Examination of the chest showed the whole of the region over the left scapula dull on percussion, with increase in vocal resonance and fine crepitations audible all over the region. A course of tuberculin was given and the man was treated as an ambulant case, though he was running a temperature in the beginning, which gradually came down to normal. A record was kept of his weight, which went up from 123 to 170 lbs. from June to December. Sputum examined at the end of the treatment showed no bacilli.

special treatment in the shape of tuberculin injections which was in vogue at that time, as he already had a course, but under the able guidance of the then superintendent, he underwent a course of special graduated hill-climbing treatment in pursuance of the theory of auto-inoculation to which added to tuberculin treatment the late superintendent used to pin his faith.

It is to be noted that he is a sufferer from filariasis as well. The peculiarity about this is

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DERMAL LEISHMANIASIS IN CHINA

By Y. T. YAO

and

C. JUNG SUN

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THE first case of post-kala-azar dermal leishmaniasis was reported in India by Brahmachari in 1922. A series of cases of this infection were reported later on by Napier and other workers; but not a single case has been reported from treated kala-azar cases in the endemic area in China up to the present time.

Both of us have made a careful search among the treated cases either from other clinics or in the outpatient department of our Kala-azar Research Station, Tsing-kiang-pu, China. So far we have found only three cases which

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that, except enlarged inguinal glands, no sign is present or was present. In his blood, microfilaria can be found any evening (8 p.m.). They have been seen so recently as 25th April, 1936, i.e., full twenty-four years after.

*His present condition (25th April, 1936).—*He is a normal man except for the filariasis. Chest examination showed no abnormal sound nor any vestige of dullness.

Fluoroscopy.—Left apex showed want of illumination.

Film showed several large calcified nodules and numerous small ones in the left apex. No remnant of the cicatricial patch except these could be found.

It is also to be noted that, in the report of this case published in 1914, I made the following concluding remarks which have a great significance in the light of the present events. These are as follows:—

'It is, of course, too early to judge whether he is going to get a relapse or not. But judging from other similar cases, in some of which five years have elapsed without a relapse, it is possible to predict a bright prospect for the patient'.

Conclusion

1. This case showing, as it does, complete healing of an extensive lung lesion, and that the healed state has been kept up for a quarter of a century, illustrates that tuberculosis does heal and that completely.

2. From the x-ray film showing only several calcified nodules in the left side but no marked darkness, one can conclude that the old cicatrix, evidence of which is recorded in the published report of 1914, is gradually resolving.

This observation is of interest as one rarely has the opportunity of examining a case twenty-four years after the healing of an active focus,

showed early depigmented areas practically all over the body, about one year after treatment. All the three cases were of the early depigmented type. There was no ulceration and no anaesthesia or hyperaesthesia. The nodular stage has not been found so far in our clinic.



Fig. 1.—Dermal leishmaniasis showing depigmented spots on the chest.

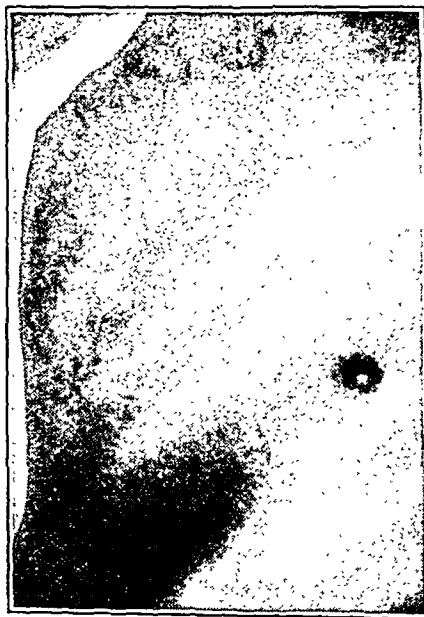


Fig. 2.—Dermal leishmaniasis showing the most conspicuous depigmented spot on right flank.

In all the three cases it was not possible to find parasites by direct examination of the tissues, although cultural methods showed their presence in one of the cases. The patient gave the history of the first appearance of the depigmented patches about one year after treatment

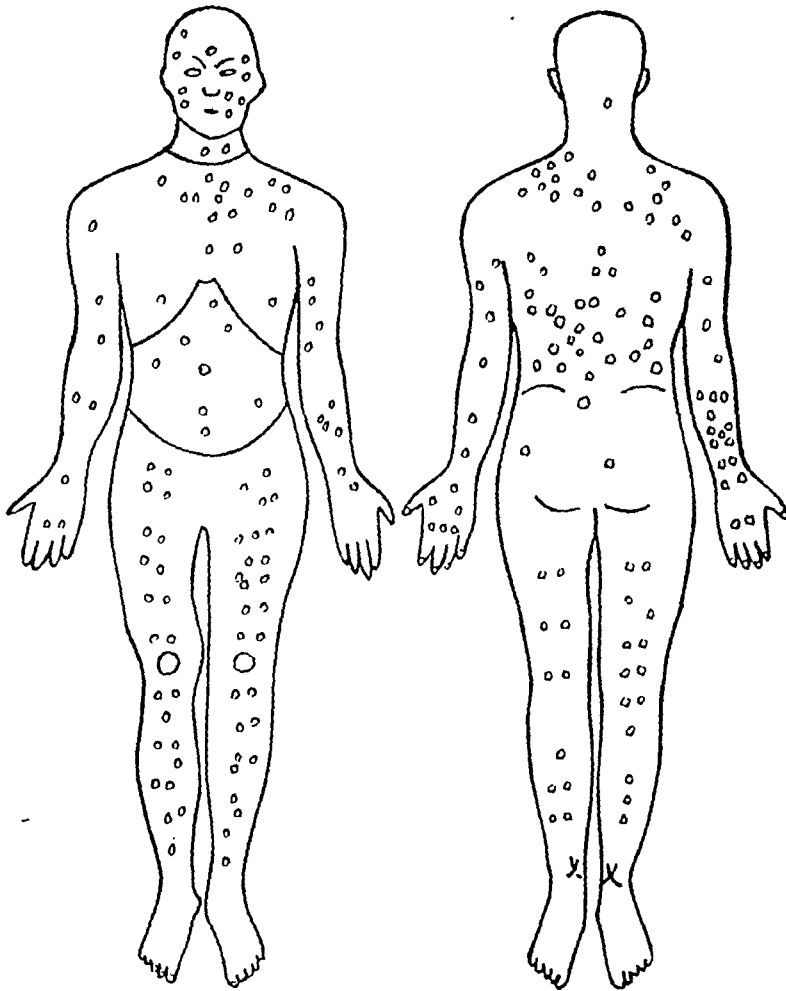
was completed and all the symptoms of kala-azar had disappeared. All the three cases were patients who have been living in the kala-azar endemic areas. We will report just the case whose diagnosis has been confirmed by positive findings of the flagellates from culture in N. N. N. medium.

Case no. 350531, male, aged 54, was admitted to our ward on 4th April, 1935. Onset of the disease was from March 1934. The patient was treated in the other clinic and the depigmented areas developed all over the body about one year after the treatment. Smears taken

dermal leishmaniasis in the endemic area in China at the present time. Wider survey of this infection should be carefully conducted both in the kala-azar clinics as well as in the field. A field laboratory is also quite necessary to facilitate this type of work. It must be remembered that cases of the nodular type of dermal leishmaniasis which are quite common in India, might be mistaken for leprosy. As in India, in the early depigmented stage it is not usually possible to find parasites by direct examination

Distribution of lesions

分佈狀況



正面

背面

from the tissue on the right flank did not show any parasite, but flagellates were found from culture in N. N. N. medium which was made on 8th April, 1935, and reported to be positive on the 20th of the same month. Another course of antimony treatment with 'neostibosan' (total dose—3.8 gm.) was given in fourteen doses starting from 4th April, 1935, to 10th May, 1935. The depigmented areas became darker and smaller after eight injections with the total dose of 2.05 gm. Tissues taken on 28th August, 1935, from one of the marked depigmented spots revealed no further findings of parasites either from direct smears or on culture in N. N. N. medium.

Discussion.—We are not able to draw any conclusion about the incidence of post-kala-azar

of the tissues, although cultural methods may show their presence.

Acknowledgments.—Our thanks are due to Drs. L. Everard Napier and R. O. A. Smith, of the Calcutta School of Tropical Medicine, Calcutta, India, for their kindness in showing us a number of dermal cases in pictures and full explanation of those cases when the former was attending the Ninth Congress of F. E. A. T. M. in Nanking, October 1934. The junior writer (C. J. S.) was fortunate enough to see a large number of cases in India in their presence.

EXPERIMENTAL STUDIES ON ATEBRIN

By F. MIETZSCH

H. MAUSS

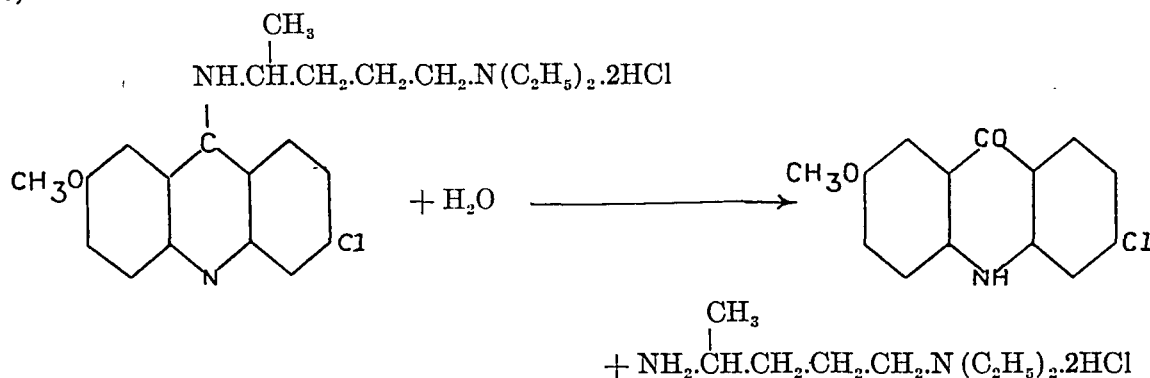
and

G. HECHT

THE question has several times arisen, during the practical use of atebtrin for parenteral therapy, as to how far the solutions applied can be kept unchanged, and whether any danger of by-effects, following their decomposition, exists. To elucidate this point the following investigations were carried out.

Chemistry (by F. M. and H. M.)

Watery solutions of atebtrin will not keep indefinitely, as atebtrin, like other N-basic-substituted-9-aminoacridine salts, decomposes in such solutions by slow hydrolysis in the following manner (Magidson and Grigorowsky, 1936).



The cyclical component 2-methoxy-6-chloroacridone, which splits off, displays almost no basic properties in watery solution and, as a result of its own very low solubility in water (below 0.1 per cent) and in watery solutions of atebtrin dihydrochloride, is precipitated as a light-yellow crystalline powder. The aliphatic component α -diethylamino- δ -aminopentane remains in watery solution in the form of its dihydrochloride.

These changes explain the displacement of the hydrogen-ion concentration of the solution which occurs with gradual decomposition. A 0.5 per cent solution of atebtrin dihydrochloride in water has a pH of about 4.2. The basicity of the atebtrin base due to one amino group aliphatically bound and to another in ring form does not suffice for the complete neutral fixation of two molecules of acid. Thus with increasing decomposition the pH of the atebtrin dihydrochloride solution approaches the neutral point, 7.0.

2-methoxy-6-chloroacridone is characterized by the fact that, like many other acridones, it does not dissolve to any extent either in alcohol alone or in caustic soda alone. On the other hand it dissolves readily in a mixture of the two solvents to form a solution with an intense yellowish-green colour and a corresponding fluorescence. It can be identified with the synthetic product (obtained by a different method) in its original form or in the form of its reactive products.

By gentle evaporation of its watery solution α -diethylamino- δ -aminopentane can be isolated

as the dihydrochloride and identified in the form of its double salts with heavy metals, *e.g.*, in the form of the double salts with gold or platinum chloride.

Decomposition cannot be hastened to any noticeable extent by exposure to sunlight or irradiation with ultra-violet light, nor were any associated oxidation phenomena observed.

Of the greatest importance in its practical application is, of course, the rate of decomposition of watery solutions of atebtrin. Owing to the insolubility of the acridone compound this can easily be studied by noting the acridone precipitate.

We found that a 1.0 per cent solution of atebtrin dihydrochloride could be kept for 3 weeks at a temperature of 37°C. without any separation of the acridone component occurring. A solution which had been sterilized for about $\frac{1}{4}$

hour in a current of steam at 105°C. could only be kept for a considerably shorter period. In this case the first traces of acridone appeared after a few days. On heating a 0.5 per cent solution of atebtrin dihydrochloride in a boiling water-bath, acridone began to precipitate after heating for 1 $\frac{1}{4}$ hours. For the complete decomposition of a 0.5 per cent solution of atebtrin dihydrochloride 60 hours' refluxing was necessary. In one experiment 5.38 g. acridone compound was obtained from 10.00 g. of atebtrin dihydrochloride, *i.e.*, 98.0 per cent of the theoretical amount.

In view of these experiences the issuing of a watery solution of atebtrin for parenteral treatment was out of the question, as it did not appear that watery solutions of atebtrin would keep sufficiently well under the particularly adverse conditions of the tropics (storage for years at high temperatures). It appeared advisable therefore to supply physicians with atebtrin in the form of one of its salts in a dry ampoule. The solubility of atebtrin dihydrochloride, amounting to 2 to 3 per cent at room temperature, is in itself sufficient for the preparation of solutions suitable for injection. It has recently been found, however, that solutions even stronger than 3 per cent are well tolerated when injected intramuscularly. It was therefore desirable that a more soluble salt should be made available.

For parenteral administration, therefore, atebtrin di-methane sulphonate, *i.e.*, the salt of the atebtrin base with two molecules of methane sulphonic acid ($\text{CH}_3\text{SO}_3\text{H}$), was used instead of atebtrin di-hydrochloride. This salt is characterized by its excellent solubility in water as compared with atebtrin di-hydrochloride. At 20°C . it is possible to prepare without any difficulty solutions containing 60 per cent of the preparation. Although this extraordinary degree of solubility cannot be utilized to its full extent for the preparation of highly concentrated solutions for injection, owing to the irritative phenomena which would occur at such concentrations, the margin between the concentrations possible and that needed for practical purposes is such that an almost immediate solution of the contents of the ampoule can be obtained, thus making the salt convenient to handle by the physician. As the ratio between the molecular weights of atebtrin di-methane sulphonate and atebtrin di-hydrochloride is almost exactly 5 : 4, 0.125 g. of the new product must be injected instead of 0.1 g. in order to administer the same quantity of atebtrin base.

In view of the foregoing facts it is advisable to use freshly prepared solutions only, and not to submit these to prolonged boiling. Atebtrin di-methane sulphonate has been tried clinically since 1934 under the temporary name of *atebtrin-musonat* and it was known by this name during the Ceylon malarial epidemic. It is now supplied as atebtrin for injection in dry ampoules containing 0.125 and 0.375 g. of atebtrin di-methane sulphonate, which correspond in activity to 0.1 and 0.300 g. of atebtrin di-hydrochloride, respectively.

Pharmacology (by G. H.)

The chemical facts relating to the decomposition of atebtrin having been described, it is now possible to discuss their practical significance for the therapeutic application of atebtrin. Decomposition does not occur in tablets stored in dry conditions, but it is not possible to store watery solutions of atebtrin for injection. Watery solutions in ampoules ready for use cannot, therefore, be supplied; but there is no objection to the use of freshly prepared solutions provided these are injected soon after they have been made.

The rate of decomposition is so slow that there are no traces of it during the first 12 hours after the preparation of the solution. Only after a very slight degree of decomposition has occurred, which is generally the case when the solution has stood for some time—it may be days—does this become noticeable, by the solution then turning turbid. Once this has occurred it is no longer advisable to use the solution, as intravenous injection is liable to be followed by embolism. There is no danger of this occurring with intramuscular injection

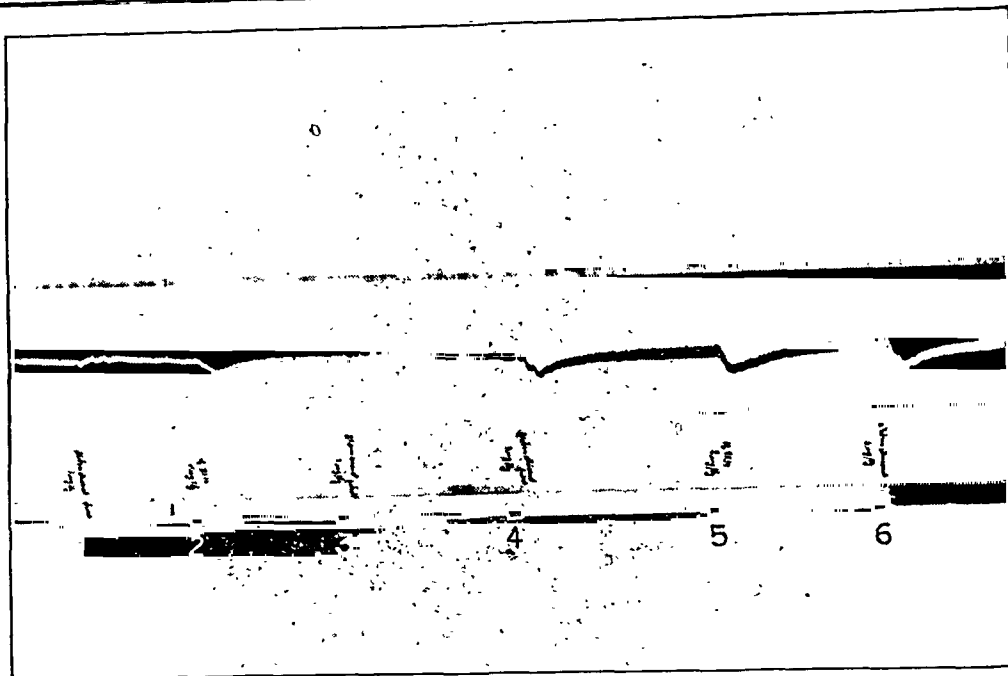
or administration by mouth, but the activity of the preparation diminishes as decomposition proceeds.

Against this view it is possible to raise the objection that the products of decomposition might be very toxic. It would follow from this that a very slight degree of decomposition, undetectable to the naked eye, might give rise to special toxic effects. Pharmacological investigation of the two products of decomposition individually, as well as of a decomposed solution of atebtrin, shows that this is not the case. 2-methoxy-6-chloracridone is almost completely insoluble in water. Given by mouth to cats it is completely inactive in doses up to 1.0 g. per kilogramme, apart from the occasional vomiting which occurs with the latter dose. Even a dose of 5.0 g. per kilogramme is harmless to mice. (Of course it is uncertain whether any actual absorption of the compound took place in these experiments.) Experiments with parenteral injection could not be carried out, as, apart from water, the substance is also insoluble in other pharmacologically indifferent solvents. Only in methylpropylglycol was it possible to prepare a 1 per cent solution; 1.0 c.cm. of this solution was rapidly injected intravenously into a 10 kg. dog, but this gave rise to no alteration in the blood pressure as recorded by a Frank's manometer. But the indifference of this solvent and the solubility of 2-methoxy-6-chloracridone therein were insufficient for the determination of the lethal dose. We therefore conclude from these facts that this compound is devoid of all toxic action.

α -diethylamino- δ -aminopentane is not lethal for mice in doses of 500 mg. per kilo, and is only just lethal for rabbits in doses of 100 mg. per kilo intravenously. These doses correspond to the amounts of substance which would be produced by the decomposition of 1.5 and 3.0 g. atebtrin, respectively, *i.e.*, about 4 and 30 times the amount of atebtrin respectively, which would be lethal in the absence of any decomposition. It was found that the intravenous injection of even small doses of this substance in anaesthetized cats and rabbits gave rise to a transitory fall in the arterial pressure. Nevertheless this substance is no more toxic in this respect than atebtrin itself, so that there is no possibility of special toxic effects occurring with the appearance of this product of decomposition (see Curves I and II).

Thus it was to be expected that decomposed solutions of atebtrin would display no new toxic effects on pharmacological investigation. This was fully confirmed by further experiments. Two different solutions were used for these experiments. The first was a 1 per cent solution of atebtrin di-methane sulphonate which had been refluxed for $1\frac{1}{2}$ hours after which there was a distinct precipitate of 2-methoxy-6-chloracridone: the clear supernatant fluid only was

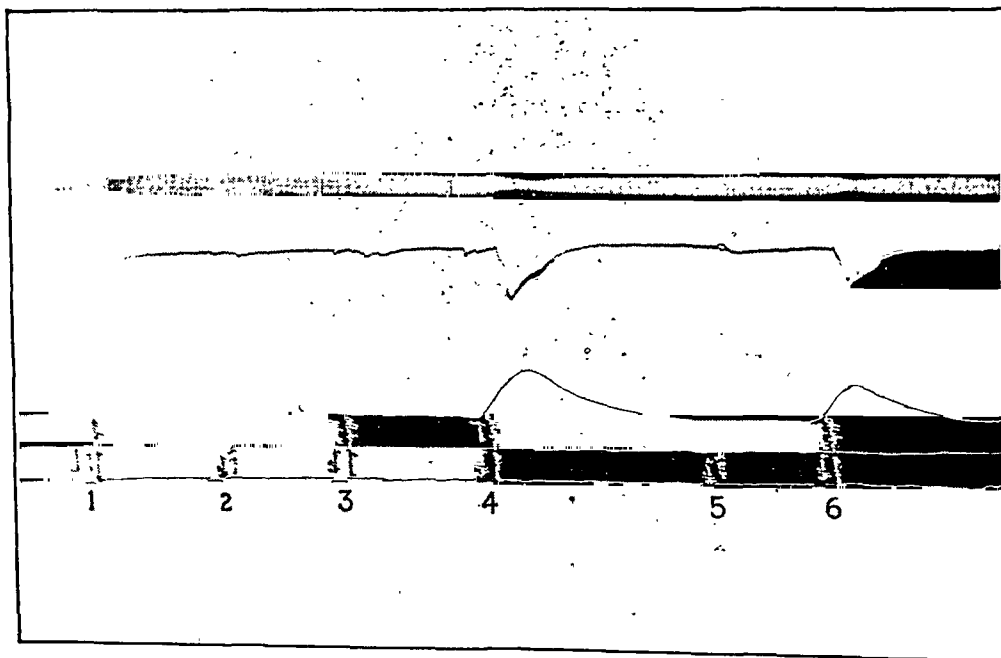
(Continued on page 524)



Curve I. Cat. Anæsthetic: Urethane.

From above downwards: respiration, arterial pressure, pressure in the right auricle, time markings 10 secs., injection signals. Injections into the femoral vein always given in 30 secs.

- (1) Atebrin-musonat (di-methane sulphonate), fresh solution, 3 mg. per kilo.
- (2) α -diethylamino- δ -aminopentane, 1 mg. per kilo.
- (3) Atebrin-musonat (di-methane sulphonate) boiled, 3 mg. per kilo.
- (4) As (1), but 6 mg. per kilo.
- (5) As (2), but 2 mg. per kilo.
- (6) As (3), but 6 mg. per kilo.



Curve II. Rabbit. Anæsthetic: Urethane.

From above downwards: respiration, arterial pressure, pressure in the right auricle, time markings 10 secs., injection signals. Injections into the femoral vein always given in 30 secs.

- (1) Atebrin-musonat (di-methane sulphonate), fresh solution, 3 mg. per kilo.
- (2) α -diethylamino- δ -aminopentane, 1 mg. per kilo.
- (3) Atebrin-musonat (di-methane sulphonate) boiled, 3 mg. per kilo.
- (4) As (1), but 6 mg. per kilo.
- (5) As (2), but 2 mg. per kilo.
- (6) As (3), but 6 mg. per kilo.

(Continued from page 522)

used. The other was a 1 per cent solution of atebirin di-hydrochloride which had been exposed to intensive ultra-violet irradiation for 40 hours. On testing the toxicity of these two solutions by injecting them subcutaneously in mice no difference was found, in this respect, between them and fresh solutions of atebirin. It was also shown in experiments on anaesthetized animals that the acute effects on the circulatory organs were the same as occur with fresh solutions (see Curves I and II).

Summary

In watery solutions atebirin undergoes a slow process of decomposition at normal temperatures, which is accelerated by heating. Chemically, this process consists in a splitting off of

the aliphatic basic side-chain by hydrolysis. The two end-products of this process can be estimated quantitatively. The toxicity of these two end-products is considerably less than that of atebirin in corresponding amounts. There is no increase in toxicity with decomposition.

In consequence of this decomposition process it is advisable to inject watery solutions of atebirin immediately they have been prepared. By mouth watery solutions should not be given later than 12 hours after preparation (say on the following day) as the full degree of activity cannot be depended upon after this period has elapsed.

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A Mirror of Hospital Practice

A GIANT DERMOID CYST

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THE subject of the accompanying photographs was a Badaga cultivator, giving his age as 33, who came to St. Bartholomew's (Government Headquarters) Hospital, Ootacamund, to be relieved of the tumour. He stated that the swelling had been present as long as he could remember, but it was not possible to ascertain with certainty whether or not it was present at birth, that is to say whether it was truly congenital. It had grown slowly and painlessly all his life, but with some increased rapidity during the previous four months. Concealed as it was in the hair (Badagas do not cut the hair of the head), and by the turban, it had caused no disability, but the time had arrived when he desired to be rid of his disfigurement.

The tumour was uniformly firm in consistence, with a smooth unlobulated surface and without a definite palpable edge: fluctuation could not be detected, and there was opacity to transmitted light. The mass was mobile on the deeper tissues, and not attached to the skin, which though stretched and thinned was in no way adherent. The skin over the swelling was definitely colder to the touch than on the opposite temple, there was no pulsation and no impulse on coughing. An x-ray photograph demonstrated the absence of a defect in the underlying skull.

The tumour was removed unopened, under general anaesthesia. It could be freely dissected from the tissues in which it lay: it rested on the temporal fascia, which was quite normal in appearance, and unscarred, overlapping to a small extent the orbicularis oculi muscle at its inner angle; in no place was the pericranium exposed when the tumour was freed. An ellipse of redundant skin was excised with the tumour, and the wound closed with an intradermic silk-worm-gut suture, with a 48-hour rubber glove drain through

a stab in the lower flap. Healing was uneventful and the patient left hospital on the 14th day, very pleased at the loss of his deformity (figure 2).

The amputated cyst, of an ovoid shape, measured in circumference 12 inches antero-posteriorly, and 8 inches



Fig. 1.

vertically: it weighed 5½ ounces and the contents were 5 ounces of a thick, oily, pale grey, semi-solid material, resembling, except in colour, the contents of an uninfected sebaceous cyst. The inner surface or lining

of the cyst had the appearance of delicate skin, very wrinkled when emptied of its contents, but the wrinkles smoothed out easily on stretching. The 'skin' was of a faint pink colour, except on its deepest aspect, where there was an area 1 inch in diameter of mottled pinpoint spots of black pigmentation. (It would be of



Fig. 2.

interest to know whether or not the lining of a dermoid cyst in the coloured races reproduces the skin pigment—melanin—which gives the colour to the skin generally.) This pigment, arranged in granules, is found chiefly in and between the cells of the stratum mucosum (prickle cell layer), but, as described later, in the skin-like tissue of this specimen there was no clear differentiation into the various cell layers that make up the true skin. Unfortunately the microscopic section did not traverse this pigmented area. In certain places the epithelial lining was heaped up into sodden whitish-looking flakes easily separable, and in a few areas there were small flat-topped elevations $\frac{1}{4}$ inch in diameter. Hairs, teeth and other epidermal appendages were absent.

Microscopic examination showed the cyst wall to be a stratified epithelium of six or seven layers. The superficial layers showed keratinization, gradually fading off into homogeneous eosin-staining laminae lying parallel to the surface. There was no definite differentiation of the cell layers into the various strata which make up the true skin. The epithelium rested on an undifferentiated avascular fibrous tissue: a true corium with its papillae and capillary loops was not found and, apart from a few typical sebaceous glands, true skin appendages such as hair follicles, sweat glands and tactile corpuscles were absent. In fact, the cyst lining might be described as a primitive epiblastic structure resembling poorly developed skin, the type of skin that is found over a wound healed by granulation.

This tumour caused some doubt in diagnosis before operation, as it must be a rarity for a

subcutaneous dermoid to attain these dimensions. A dermoid cyst of the face, as usually seen, occurs in children or adolescents and is a hemispherical tumour perhaps $\frac{3}{4}$ inch in length. Even if removal is refused at this stage, growth is said to cease when this size is reached, so that even in the adult a typical dermoid grows no larger. The tumour was obviously an innocent one: lipoma or fibroma seemed possible alternatives. The absence of lobulation of a definite palpable edge, and of dimpling of the stretched skin, were against a lipoma, but on the other hand the skin temperature over the tumour was definitely lowered. This diminution of skin temperature is said to be a characteristic of the subcutaneous lipoma. Accurate estimation of skin temperatures requires a skin thermometer, or better some kind of electric thermo-couple, neither of which were available in this case; the difference was quite appreciable on the two sides by manual palpation. Subcutaneous fibromata of the head and neck, even if not forming merely a part of the picture of neuro-fibromatosis, are generally multiple and small, growing from the sheaths of unnamed cutaneous nerves. Nevertheless as obscure, apparently innocent tumours often turn out to be fibromata or fibro-sarcomata, this possibility was considered.

CONJUGAL VENEREAL GRANULOMA

By R. V. RAJAM, M.B., M.S. (Mad.), M.R.C.P. (E.)

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THE rarity of venereal granuloma in married couples is usually brought forward as a point in favour of the non-venereal origin of the disease. It appears that no authentic instance of conjugal granuloma has so far been reported in the literature. We have seen several cases of conjugal disease during the past five years and, in view of the recent articles on the subject in the *Gazette*, and the controversy thereon, I am herewith sending you the case records of a definite instance of conjugal granuloma.

A Hindu male, aged 28 years, with his wife, aged 17 years, came to the venereal department of the General Hospital with the following history :

The couple were married nine months before they came under our observation. Three months before marriage the man developed a small painless sore on the penis a week after coitus. The sore remained small and stationary and did not worry him. He married three months after and had regular sexual relations with his wife in spite of the non-healed sore on his penis. His wife developed a similar sore on her genitals a few weeks after marriage and both husband and wife waited for nearly nine months before they sought treatment.

Husband.—A small painless, unindurated, granulomatous ulcer on the ventral aspect of the glans penis situated on the right side of frenum and tunnelling under it. Inguinal glands not palpable. No ulceration or sore on any other part of the genitals or groin. Duration one year.

Wife.—A pseudo-elephantoid condition of the clitoris with scarring and constriction of its base, extensive



Granuloma venereum on penis.



Granuloma venereum on clitoris.

granulomatous ulceration and scarring of the fourchette and the lower half of the labia, resulting in occlusion

of the vaginal outlet. Duration nine months. Groin glands not palpable. There was no ulceration of the upper part of the vulva or groin.

In both husband and wife the smears taken from the ulcers were positive for Donovan organisms. The tests for other venereal diseases were all negative.

They were given a course of foudadin intramuscularly. The husband's condition rapidly healed in a fortnight after eight injections. The wife's granuloma was slower in healing and took seven weeks and eighteen injections of foudadin. The elephantoid clitoris was amputated under local anaesthesia and the operation wound healed by first intention.

The interesting points in these two cases are:

1. The definite history of premarital sore in the husband and the development of a similar condition in the wife after marriage.
2. The simultaneous presence of active granuloma in both husband and wife.
3. The small stationary nature of the lesion in the husband in spite of the longer duration.
4. The greater extent of ulceration in the wife with early formation of pseudo-elephantiasis of the clitoris in spite of the shorter duration of the condition.

THROMBOPHLEBITIS MIGRANS

By S. C. CHATTERJEE, M.B., M.R.C.S. (Eng.),
M.R.C.P. (Lond.)

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THROMBOPHLEBITIS of known aetiological cause is not uncommon and cases have been described from time to time. Recurrent phlebitis for which no obvious aetiological factor could be ascertained was first described by Briggs (1905) and he tried to explain the condition on the basis of changes occurring in veins simulating arterio-capillary fibrosis.

Thrombophlebitis migrans seems to be quite a separate entity from the above conditions. This rare malady of obscure aetiology being characterized chiefly by its recurrent attacks of migrating phlebitis in peripheral as well as in visceral veins.

Moorhead and Abrahamson (1928) have described four cases, showing recurrent attacks of phlebitis in various sites, e.g., in the upper and lower limbs, in the mesenteric veins causing abdominal pain, melæna, etc., in the lungs producing pain in chest and hæmoptysis. In one case in a cardiac vein giving rise to anginal pain with a rapid fibrillating pulse—a most uncommon and interesting phenomenon. Excepting for these case records very little can be found in the English literature of this rare disease.

Patient, B. K. D., a thin man of 25, was seen on 10th January, 1936, with abdominal pain and vomiting, that started suddenly about 24 hours previously. There were rigidity and tenderness in the right iliac fossa, temperature varying between 102°F. to 103°F. Blood count showed moderate leucocytosis. The possibility of appendicitis was thought of and the patient was treated on conservative lines. He gradually recovered within the next 12 days.

About two weeks later the patient complained of severe pain in the right side of his chest and had

hæmoptysis. There was a patch of dullness with deficient breath sounds and a few crepitations over the right infra-axillary region. His general condition became rather low, temperature varying between 100°F. to 101°F. Sputum showed no acid-fast bacilli, blood showed moderate leucocytosis. This condition cleared up within the next two weeks.

During the latter part of this attack the patient complained of pain in his left leg—the leg being swollen and painful.

Within a week he developed almost simultaneously a tender mass over the right rectus and swelling of the right lower limb, which became almost immobile from pain and swelling. Over the mass on the abdominal wall could be felt a thrombosed vein and along the upper and medial aspect of the right thigh a thickened tender cord-like structure—the thrombosed saphenous vein. With each of these fresh attacks there was slight pyrexia. Blood culture was sterile, urine and stool showed no abnormality. There was no evidence of arterial obliteration in the limbs. Patient had severe pyorrhœa. Past history revealed nothing worth noting.

The patient became very ill with the last attack, the pulse getting very feeble and rapid; he ran an irregular temperature. He continued in this state for about three weeks and gradually recovered. No special treatment was given; he was given big doses of sodium citrate, plenty of lemon juice, fluid drinks, cardiac stimulants and sedatives, as the symptoms arose.

Comment

Not before we felt the thrombosed vein over the tender mass in the rectus were we really definite about the diagnosis. The thrombosed saphenous vein settled the matter finally that we were dealing with a case of thrombophlebitis migrans. All the events as presented by the above case illustrate beautifully the main features of this malady, i.e., its tendency towards migrating phlebitis affecting the peripheral as well as visceral veins.

When a segment of peripheral vein is affected the part becomes swollen and painful; in the above case the left leg and right lower limb were swollen due to thrombosis of deep veins of the left calf and right saphenous vein respectively. The abdominal pain with which the patient was admitted (what we thought to be an attack of appendicitis) was really due to thrombosis of a mesenteric vein. Pain and hæmoptysis due to pulmonary thrombosis and the tender lump over the rectus due to thrombosis of a superficial vein of the abdominal parietes.

The ætiology of this condition is still obscure—the signs of local inflammation, pyrexia and moderate leucocytosis with each attack suggest an infective condition. One of the cases of Moorhead and Abrahamson had severe pyorrhœa, as did our patient. Gibson (1929) mentions a case starting with sore throat. Culture from gums and throat yielded an abundant growth of *Streptococcus viridans*. The rôle of such a common condition as pyorrhœa in the ætiology of so rare a disease is very difficult to assess. Boyd (1934) describes similar migrating phlebitis occurring in superficial veins in the earlier stages of thrombo-angiitis obliterans. But thrombophlebitis migrans is not the same as thrombo-angiitis obliterans as none of the

record cases developed similar signs and the latter condition is limited to the peripheral vessels, there being no phlebitis of the visceral veins.

Ultimate prognosis regarding recovery is good. In spite of this widespread thrombosis, embolism has not been known to occur, because of the thrombus being firmly adherent to the inflamed vessel wall. Ætiology being obscure no specific treatment has been described. Intravenous sodium citrate has been tried without much impression on the course of the disease.

My thanks are due to Lieut.-Col. E. O'G. Kirwan, I.M.S., for permitting me to publish the record of this interesting case.

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PRIMARY PYOCYANEA INFECTION OF THE SKIN

By GANAPATI PANJA, M.B. (Cal.), D.B. (Lond.)

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SECONDARY pyocyanea infections in wounds and abscesses are well known but primary pyocyanea dermatitis has not been recorded as far as I am aware, therefore these two cases are reported :

(1) J. B. S. came to me with lesions of eight months' duration on the dorsum of one of his hands. There was a rash like prickly heat with œdema and oozing. The weeping was very marked and tiny shallow ulcers were seen. The patient had tried acriflavine, calamine, gentian violet lotions and even x-rays but to no effect. His skin could not tolerate any hot fomentation. The only thing that gave him relief was a zinc oxide paste, but no cure was obtained. An œdematous area with the skin intact was scraped with a sterile knife until oozing started. A drop of the watery fluid was cultured and a pure culture of *Pseudomonas pyocyanea* was obtained. An autogenous vaccine was prepared and injected in graduated doses from 5 to 50 millions. The improvement was striking a few days after the first injection and the disease was cured after a few more injections.

(2) Mrs. D., aged about 20, came with moist papular lesions on her hands and neck. There was slight fever, redness, œdema, vesicles and copious oozing. No glands were enlarged and dressings did not show any yellowish or greenish stain. The disease was of about a month's duration. Calamine and stock streptococcal and staphylococcal vaccines did not do any good. On culturing the vesicular fluid, a pure culture of *Pseudomonas pyocyanea* was obtained. An autogenous vaccine was prepared and administered. The patient recovered quickly and there was no relapse.

Discussion.—The dermatitis in these two cases was primarily caused by *Pseudomonas pyocyanea*, as a pure culture was obtained from the lesion and autovaccine cured both the cases quickly. Non-specific immunization cannot be the cause of cure, as a mixed staphylococcal and

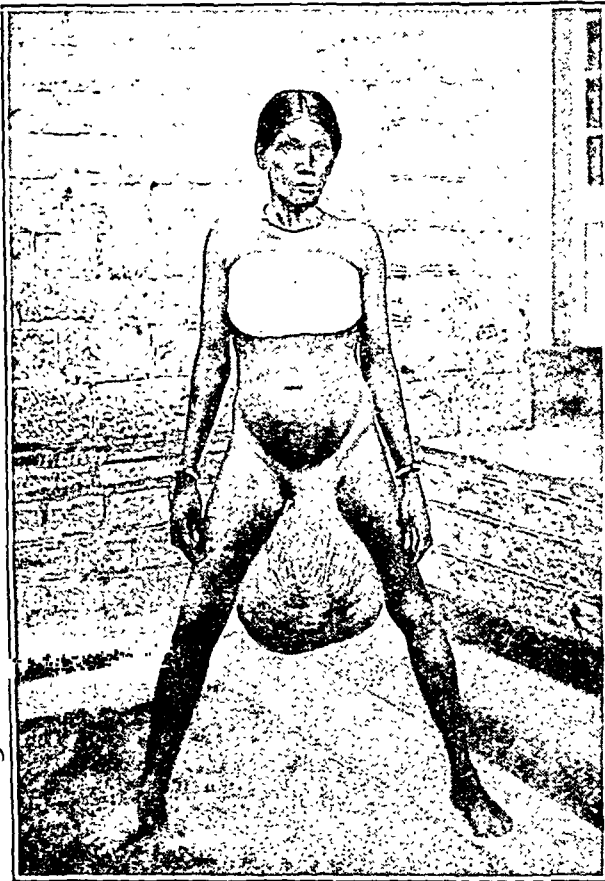
streptococcal vaccine failed to cure the second case. Papulo-vesicles, œdema, ulcers and copious watery secretion were salient features of the condition.

A CASE OF ELEPHANTOID TUMOUR OF THE LABIUM MAJUS

By V. RAMACHANDRA RAO, M.B., B.S.

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A HINDU female coolie, aged 35, well nourished, was admitted for the treatment of a tumour arising from the left labium majus.



Before operation.

History.—Married—mother of 5 children—last child aged 3 years—all the children are alive and all the labours were normal.

For 15 years the patient has had occasional temperature at night. Sometimes she used to have swelling of the right leg which lasted for about 10 or 15 days. For the past 12 years she noticed thickening of her left labium majus, the swelling gradually becoming bigger and bigger. In the beginning it was elongated but finally assumed a globular shape and attained the present size. The growth was rapid for the past 5 or 6 years and so the patient was not able to do her work properly and she is not able to walk comfortably. The skin is markedly thickened.

Local conditions.—A large tumour is seen arising from the left labium majus. The skin is nodular and rough. No ulceration anywhere. No dilated veins visible.

Measurements: Vertical .. 12 inches
Horizontal .. 10 "
Circumference .. 31 "

Treatment.—The whole tumour was excised under general anaesthesia by the superintendent of the hospital. The patient stood the operation well.

The tumour weighed 27 pounds.

Progress.—The patient made an uneventful recovery. The lower part of the wound became septic and so the stitches gave way and it finally healed by granulation.

The interesting points of this case are:—

1. The enormous size of the tumour.
2. Only three years ago the woman had a child in spite of the tumour.

My thanks are due to my chief Dr. E. A. Varada Ayyar, superintendent of the hospital, for permission to report the case.

A CASE OF HUMAN INFECTION WITH *DIENTAMÆBA FRAGILIS* JEPPS AND DOBELL, 1918, IN CALCUTTA

By B. M. DAS GUPTA

Calcutta School of Tropical Medicine

It will be seen from the reports of the Professor of Protozoology, Calcutta School of Tropical Medicine (1922—35), that infection with most of the intestinal protozoa has been found in the patients treated in the Carmichael Hospital for Tropical Diseases. The only amœba which has not been reported previously is *Dientamœba fragilis*. This amœba was first described by Jepps and Dobell in 1918. Since then many workers have recorded its occurrence from man in different parts of the world. It



1



2



3



4



5

H. Roy.

All figures are drawn with a camera lucida from slides fixed with Schaudinn's fluid and stained by Heidenhain's iron-hæmatoxylin method ($\times 1,500$).

Figs. 1 and 2.—Large forms with numerous food inclusions and vacuoles. Fig. 2.—Individual with one large nucleus.

Figs. 3 and 4.—Small individuals with two nuclei.

Fig. 5.—A uninucleate individual showing four nuclear granules.

has also been reported from monkeys in the Philippines by Hegner and Chu (1930) and in Calcutta by Knowles and Das Gupta (1936). Unlike the other intestinal amœbæ this species

is very uncommon in this locality. Furthermore, its recognition is difficult as it undergoes rapid degeneration outside the body of the host. Lately, however, Wenrich (1936) has observed that this amoeba may remain viable in the faeces for as long as 24 to 48 hours. But this is probably not the case under tropical conditions.

The patient who showed the infection is a young Bengali, resident of Calcutta, who has never been out of India. There is history of occasional attacks of diarrhoea alternating with constipation for about two months. Five specimens of his stools were available for examination. The results are as follows:—

15th February, 1936 ..	Liquid stool. No cell exudate. Motile <i>D. fragilis</i> +. Motile <i>Enteromonas</i> +. <i>Blastocystis</i> + + +. Culture on MacConkey's plate —. Only lactose fermenters.
16th February, 1936 ..	Soft motion. Scanty <i>D. fragilis</i> . <i>Blastocystis</i> + +.
17th February, 1936 ..	Formed stool. No protozoa. Scanty <i>Blastocystis</i> .
24th February, 1936 ..	Formed stool. No protozoa.
3rd March, 1936 ..	Formed stool. Very scanty small cysts. ? <i>Enteromonas</i> .

The infection lasted for a very short time, *Dientamoeba* being detected on the first two examinations only.

The general morphology of *D. fragilis* has been fully described by Dobell and O'Connor (1921). One peculiarity was, however, noticed in my preparations. Occasionally amoebae measuring up to 16.5μ in diameter were encountered. On the other hand, the size of *D. fragilis* as noted by Dobell and O'Connor varies from 3.5 to 1.2μ in diameter. This difference as regards the size may be due to flattening of the amoeba by pressure in spreading the smear before fixation. Of late, however, Wenrich (1936) has also noted the occurrence of large forms measuring up to 18μ .

Summary.—A case of infection with *Dientamoeba fragilis* in man is reported for the first time in Calcutta.

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A CASE OF PROLONGED HUNGER-STRIKE

By H. BASIL ROSAIR, L.M.R.C.P., L.R.C.S.I., D.T.M.
MAJOR, I.M.D.

Superintendent and Medical Officer, Central Prison,
Bareilly, U. P.

Convict M. K. resorted to hunger-strike on the 18th May, 1934. His weight was then approximately 130 lbs.

Regular forcible feeding was commenced on the 2nd July, but previous to this date he had been forcibly fed on eight or ten occasions. His weight was 95 lbs. and there were definite signs of weakness and exhaustion. Between the 2nd July and the 15th October, his weight ranged between 91 and 96 lbs. In December 1934 the man's weight dropped to 85 lbs. which was the lowest recorded during the period of nineteen months of hunger-strike. Between December 1934 and January 1936, when the convict abandoned his hunger-strike, his weight varied between 85 and 105 lbs. The increase or decrease was mainly dependent on the quality and quantity of liquid food given.

Hunger pangs were confined to the first seven days of the fast only. Nausea was an unpleasant symptom from time to time but usually this was easy to check with a little bicarbonate of soda in barley water. The mind was always very active and if anything more alert than normal.

Forcible feeding through the nose by means of a soft rubber tube was the only type of feeding resorted to. It was fortunate that the prisoner after the first ten days or so of forcible feeding offered little or no resistance. The type of food and the quantity used was varied as the condition of the prisoner demanded. Frequently I reduced the routine feeding to just once a day and this would be allowed to go on for many days till the weight came down to about 90 lbs.

The following foods were used:—milk—soup—raw eggs—mung dāl—barley water—glucose D—Roboleine—orange juice—cod-liver oil—olive oil.

Since the prisoner has given up his hunger-strike he has rapidly increased in weight and at the time of writing this report (within six weeks from the time he commenced to take his food himself) he has almost regained all the lost weight.

There are two important factors to remember in dealing with hunger-strikers:

- (1) The different vitamins and their value.
- (2) The value of fats and carbohydrates compared with proteins.

Only carbohydrates and fats are stored as reserve energy and used as fuel whenever food is insufficient or not available. Proteins, on the other hand, are mainly utilized for tissue repair. Muscle cells are not actually destroyed and fully recover when food is consumed. In a well-nourished body or when the correct type of food is used in forcible feeding, sufficient fat can always be provided for a prolonged fast.

During my fifteen years of experience as medical officer of jails I have had to order and conduct a large number of forcible feedings and I have never seen permanent ill effects either upon the mental activity or muscular strength.

There are of course definite risks and danger when a prisoner refuses to be fed forcibly and

offers resistance with all the strength he can command. The possibility of exhaustion followed by collapse and even death must be borne in mind. Pneumonia owing to food entering the bronchial passage can ordinarily be prevented by not pouring any food into the funnel till the tube has passed well down the oesophagus.

This instance of nineteen months' hunger-strike is, as far as I am aware, a record.

CYSTIC DEGENERATION OF GLANS PENIS

By S. D. KATAREY, B.A., L.M.P., L.C.P. & S. (Bom.)
Medical Officer, Basoda (Gwalior State)

A MALE child, aged about 6 years, was brought to my dispensary for the relief of an adherent foreskin. On examination, the prepuce was found covering the entire glans penis and its orifice was turned inwards into the external urinary meatus and was continuous with the mucous lining of the urethra. It was freely movable on the glans.

Taking this to be a case of simple phimosis, I carefully separated the prepuce from the external urinary meatus and retracted it upwards to separate it off the glans penis. There were slight adhesions and these were freed by blunt dissection. The usual colour and appearance of a normal glans were not visible but a bilobed cystic structure was found occupying its place. This really consisted of two separate hemispherical cysts enclosing between them the terminal portion of the urethra. One of these cysts was accidentally ruptured during the process of separating the adhesions and the escape of typical sebaceous material gave the clue of the true nature of the condition. The situation was explained to the parents who did not agree to the removal of these cysts. Another small cyst on the dorsum of the penis was, however, removed through a separate incision, which was closed by interrupted suture. After about two days' stay in the ward, the parents took the child home and hence the further progress of the case could not be followed up.

Whether this was a congenital condition or a later growth could not be definitely ascertained. I have never heard or read of such complete replacement of glans penis by sebaceous (?) cysts and whether the extirpation of these latter structures was possible without impairing the functional utility of the organ could not be safely foretold.

A LEECH IN THE NOSE

By K. NARAYANAN, L.M.P.
R. S. Puram, Coimbatore

RAGHAVAN, aged 8 years, was brought on 7th April, 1936, to the consulting room for repeated bleeding from the nose, of 20 days' duration.

Previous history.—No illness.

Present history.—Twenty days back the boy went for a picnic with his classmates to a neighbouring hill. While bathing in the mountain brook he drank some water and drew some into his nose also. Two days after his return he had an epistaxis. The parents thought it to be due to heat and kept him quiet. Subsequently he began to bleed every three or four days from his nose.

On examination, his left nostril showed a brownish mass like a polypus. It was seen to wriggle and could not be caught with the forceps.

I considered it probable that the structure was a leech and the boy was made to draw some snuff vigorously into his nostrils. After fifteen minutes he began to sneeze, but the leech did not come out. Half an hour later when he blew his nose the leech dropped down alive.

A CASE OF MALARIA COMPLICATED WITH ERYTHEMATOUS RASH

By P. GANGULI, B.A., L.M.S., D.T.M.

and

P. B. BHATTACHARYA, M.B., D.T.M.

Medical College Hospitals, Calcutta

THE following is the report of a case of malaria in which a peculiar erythematous rash appeared in a generalized form along with high temperature and which quickly subsided after an injection of quinine :—

Patient, A. A., aged 24 years, was admitted in the emergency ward of the Medical College Hospital on the 5th April, 1936, with a history of high quotidian fever for 5 days. The immediate cause of his seeking admission was the appearance of a peculiar erythematous rash all over his body without any sensation of itching. This rash appeared on the fourth day of the fever; his eyes were congested and tonsils were inflamed. His liver and spleen were not palpable and no abnormality was detected in his heart and lungs. On examination of his blood, malignant and benign tertian malarial parasites were found in considerable numbers. Ten grains of quinine bihydrochloride was injected intramuscularly on the same day and the temperature began to fall slowly and steadily. The rash disappeared totally within 14 hours after the injection of quinine. The fever was brought under control by subsequent oral administration of quinine (8 grs., thrice daily). The temperature became normal from the 9th April. The patient was discharged with advice to continue quinine and plasmochin.

Amongst the various complications noted in the standard books, no mention is made of this peculiar complication. Castellani mentions some peculiar syndromes resembling some specific fevers, amongst which he includes a scarlet-fever-like type, characterized by scarlatiniform rash all over the body with desquamation of the horny layer and erythema of the fauces. In the present case, however, there was no desquamation. The rash simply faded away.

We have also looked through the *Tropical Diseases Bulletin* from the year 1912 to 1935, but failed to find any record of an erythematous rash among the various complications recorded.

CORRIGENDUM

IN the paper 'Against Orthodoxies in Rabies' by Major S. D. S. Greval, I.M.S., in the February issue of the *Gazette*, p. 69, column 2, para 1 from line 10 should read 'In fact the majority of viruses must be non-infective, for chances of the viruses being non-infective are greater than those of the human beings being so capriciously distributed, with regard to susceptibility, that sometimes an "80 or 90" per cent infection results though on an average it is only 16 per cent'.



The late Lieut.-Col. R. Knowles, C.I.E., M.R.C.S.,
L.R.C.P., B.A. (Cantab.), I.M.S.
Editor, "*Indian Medical Gazette*," 1928—32

Indian Medical Gazette

SEPTEMBER

THE TREATMENT OF URINARY INFECTIONS

CHRONIC PYELITIS is a condition that has always been a great source of anxiety to the physician, as well as to his patient. There may be serious manifestations; on the other hand the symptoms may be slight—a pain on the back and some tenderness on pressure over the kidneys—or even negligible, and the condition may only be found at a routine examination, but at the same time there is the feeling that at any moment the infection may spread from the kidney pelvis to the kidney parenchyma, or even re-enter the blood stream. There is in addition the fear that underlying this condition may be some more serious organic disease, *e.g.*, pyelonephrosis, tuberculosis, or renal calculus. Even if the physician can satisfy himself that the case is an uncomplicated one, that it is a mild coliform infection and that it is not causing any severe symptoms at the time, he has still his patient's psychological attitude to contend with; the hypochondriac will say with great relish 'of course you know I have bee-coli!'; and he will never be symptom-free until you can assure him that he is free from the infection.

The treatment for this condition has been notoriously unsatisfactory. Our sheet anchor, urinary antiseptics, has been singularly disappointing. The production of a highly alkaline urine by the administration of large doses of potassium citrate and bicarbonate of soda—30 grains of each every two hours—will usually alleviate the symptoms in an acute attack, but the urinary infection may still remain. Hexamine, after the urine has been made acid, is one of the most successful; sodium benzoate, alone or with hexamine, pyridium, acriflavine and numerous other drugs have each had their advocates. More recently claims have been made for hexylresorcinol. Pelvic lavage with mercurchrome or even silver nitrate has been resorted to in certain cases, but even this rather formidable procedure is not by any means always successful, and of course vaccines have had, and still have, their supporters.

A chance observation led to a distinct advance in the therapy of pyelitis. It was noticed that the urine of epileptics who had been on a high ketogenic diet remained sterile for much longer periods than did the urine of ordinary patients, and two workers in the Mayo Clinic applied this principle to their patients with pyelitis with considerable success.

For all practical purposes fats may be considered as the only ketone-producing substances in the diet, and in order to produce these in

sufficient quantities a 3 : 1 proportion of fat to combined carbohydrate and protein in the diet must be maintained for long periods. It is difficult to prescribe an acceptable diet of even these proportions, and recent work has suggested that a 6 : 1 proportion should be aimed at; this means the reduction of carbohydrate to almost nothing. To carry out such a rigid diet institutional treatment was almost essential; many patients refused to persist with this treatment and in others it failed because they did not digest the fat in sufficient quantities to produce the necessary degree of ketonuria.

It seems possible that in the treatment of chronic pyelitis the ketogenic diet has had its day and will not be used much longer. Nevertheless, it was not only in itself a useful advance, but it marked an important phase in the evolution of the treatment of this condition. Fuller, studying the nature of the bactericidal agent in the urine of patients on a ketogenic diet, found that it was β -hydroxybutyric acid and that the activity of this substance was in proportion to the acidity of the urine. It was found, however, that it was useless to give β -hydroxybutyric acid by the mouth, as it was entirely oxidized and not excreted as such in the urine. Further *in-vitro* and *in-vivo* experiments were carried out with other acids, by Rosenheim at University College Hospital last year, and, to cut the story short, he found that mandelic acid had a bacteriostatic action which compared very favourably with that of β -hydroxybutyric acid and that it was excreted almost unchanged in the urine. Moreover, the substance was shown to be non-toxic to man.

All the clinical experiments so far reported indicate very clearly that an important advance in the therapy of urinary infections has been made. Rosenheim in his original experiments showed that a high hydrogen-ion concentration (*i.e.*, a low pH value) is essential for the bacteriostatic action of mandelic acid; for example, the action is practically *nil* if the urine has a pH of 5.7, whereas it is maximal at pH 5.3. In order to maintain this degree of acidity ammonium chloride is given. At first mandelic acid neutralized by the addition of sodium bicarbonate was used; the acid alone acts as a gastric irritant: but later sodium mandelate was substituted. This does not get over the disadvantage of having to take two drugs, neither of them particularly pleasant. Holling and Platt of Sheffield have suggested that the difficulty might be overcome by giving ammonium mandelate. They used this substance in four cases with clinical success. It has, however, been pointed out that the amount of ammonium chloride necessary to bring the acid in the urine up to the necessary concentration varies in different individuals and at different times in the same individual so that the combination of a fixed amount of acidifying substance with the mandelic acid might mean either

As we have already said, the indications are that the mandelic acid treatment of urinary infections constitutes a very great advance in therapy, but it is too early to be dogmatic; the treatment is new and has only been used in a comparatively small number of cases up to the present, and therefore we do not yet know whether in the highly susceptible it may not have some detrimental effect. The greatest danger seems to be to the kidney itself, and a frequent examination of urine should be made to see that there is not any increase of the local inflammatory condition. One writer has described a case in which there was general weakness and pains all over the body, particularly in the muscles.

Mandelic acid has been used mainly in coliform infections, and, although the vast majority of bacterial infections of the urinary tract are coliform, coccal infections do occur and it has yet to be shown that the treatment is effective in these conditions; a recent writer claims that it is.

Further, it must be remembered that the treatment is only aimed at the bacilluria, or bacteriuria, and that if the primary lesion is still present the urinary infection will almost certainly recur. For this reason a very careful search for some focus of infection in the urinary or genital tracts or for some point of 'leakage' in the intestinal tract should be made; a small symptomless amœbic ulcer, evidenced by cysts of *Entamœba histolytica* in the stools, is a common source of infection in this country. Whenever possible a uro-selectan pyelogram, a cystoscopic examination, and in cases in which cystitis had been excluded, direct and cultural examination of the urine taken by ureteric catheterization and a retrograde pyelogram should be made. These will exclude, or show the presence of, such conditions as stone, carcinoma, or ureteral stricture, will show the extent of the damage already done to the kidney, and will indicate the nature of the infection.

However valuable this treatment proves to be it will not have made the treatment of urinary infections fool-proof, and, though he is now better armed, the physician is still called upon to exercise his intelligence, to investigate his cases thoroughly and to select for this form of treatment only those that are suitable.

LIEUT.-COL. ROBERT KNOWLES, C.I.E., I.M.S.

SINCE our last number appeared the medical profession in India has sustained a great loss. Lieut.-Col. R. Knowles, C.I.E., a senior member of the Indian Medical Service, and one of the best known of its research workers, died quite suddenly on the morning of 3rd August. To us the loss is a particularly poignant one as Col. Knowles was for many years on the editorial staff of this paper, first as assistant editor and then as editor, and even during the last four years, since his ill health compelled him to give up his editorial work, he has been a frequent contributor.

Col. Knowles joined Sir John Megaw (then Lieut.-Col. Megaw) on the editorial staff of the *Gazette* in 1922 and put his whole heart into the work of raising the standard of this publication. The journal, which at that time had been published uninterruptedly for over fifty years but had experienced the usual changes of fortune, entered upon a new phase of its existence under their control and within a few years the size of the journal was almost doubled, its circulation trebled, and its reputation not only as a journal for the practitioner in India but as a scientific journal of high standing with a worldwide circulation was established.

We feel sure that Sir John will agree with us in attributing much of this to Col. Knowles' untiring energy. Nothing was too much trouble for him and he would rewrite the whole paper of a contributor who was unable to express himself well, he would make a fifty-page résumé of a medical conference, and at summarizing the whole of the literature on almost any subject and picking out the essential points he had no equal. He was a rapid writer and he seldom found it necessary to correct his original typescript, which was usually cleaner than the average man's fair copy. His disposition was such that, when he undertook a task, he was full of impatience to finish it; after his day's work at the school it was quite usual for him to put in a good eight hours' writing at his desk at home—consequently his output was enormous. One of his favourite 'children' was the *Indian Medical Year*—a résumé of the medical work done in India during the previous year. This was issued as a supplement to the *Gazette* and also sold separately. The preparation of this entailed an enormous amount of labour and it was one of his greatest sorrows that, popular though it was with readers of the *Gazette*, it was not a financial success and had to be abandoned in the last years of his editorship. Probably Indian readers of the *Gazette* will remember Col. Knowles' editorship best by his long and valuable editorials summarizing the 'present position' on subjects of importance to the practitioner. A good example of this type of editorial was his very useful summary of the recent work done on pregnancy

anæmia; this was one of the last editorials he wrote and it appeared in the August number of 1932; it has been repeatedly quoted by writers in this and other journals.

Of his recent scientific contributions, the most important have been on the plasmodial infections of monkeys and these have led to his name being permanently linked with this particular study; the last of these papers appeared in the October number of 1934. His last contribution to this paper—a short but very interesting note on the fallacies in the diagnosis of rat-bite fever—appeared in our April issue this year.

All this work valuable though it was to the *Gazette* and its readers could not be done without sacrifice and it was Col. Knowles' health that suffered. His health broke down badly early in 1931 and though he returned to his work at the school and again took up the

editorship in the autumn of 1931 he was never able to put in the same long hours of work and at the end of 1932 he went Home on leave once more and never took up the editorship of this journal again.

We are fully conscious that our readers will have missed his 'touch', just as we have, during these last few years. We hoped that we should still have the privilege of publishing his contributions for many years to come but it was not to be so. After struggling against overwhelming ill health for nearly three years, throughout which his periods of duty were punctured with short periods in hospital, his stout heart at last gave out.

Elsewhere in this number we print extracts from a personal appreciation that appeared in the *Statesman* the day after Col. Knowles' death.

Special Article

NITROUS OXIDE AND OXYGEN ANÆSTHESIA FOR MAJOR SURGERY

By K. E. MADAN, M.D., D.O.M.S., F.R.S.M.

Lecturer, King Edward Medical College, Lahore

HAVING secured an apparatus for the administration of gas with oxygen for dental operations, I used this machine with necessary alterations and improvements in a large number of major abdominal operations with marked success.

Formerly nitrous oxide and oxygen anæsthesia was never administered by anyone in the Punjab, and the Mayo Hospital at Lahore is therefore the first to make regular use of this method for major surgery in the Punjab and very probably in India*.

The apparatus used was that of S. S. White Co.'s and the modifications made by me were briefly as follows:—As it was not possible to see the flow of nitrous oxide and oxygen gases through the machine, I arranged for the gases to pass from the cylinders through two different bottles containing warm water, so that the bubbling of gases through water was visible and the amount of gas could be regulated at will.

After letting the gases emerge from these bottles, I passed the nitrous oxide gas through a metal U-tube immersed in very hot water in a 'thermos' bottle, and the oxygen gas was passed similarly from another heating chamber, with the result that both the gases were heated

before being presented to the patient. The heated gases were then allowed to enter a mixing chamber, from whence they were conducted through a two-gallon rubber bag to the patient.

After an extensive use of the above-mentioned method for over five years, some of the new important facts which I observed and which are not yet widely known, at least in India, are stated below:—

1. Nitrous oxide with oxygen when administered in a warm or heated condition causes less struggling or excitement during the induction of anæsthesia, on account of the absence of irritation of the air-passages, laryngospasm, etc., and the patient absorbs the anæsthetic quickly; thereby a less amount of gas is consumed, and so there is no anæsthetic shock.

2. Nitrous oxide with oxygen is not in itself quite sufficient to obtain complete relaxation of the parietes in upper abdominal surgery, e.g., of stomach, gall-bladder, etc., and particularly so in cases where the patient has had a rigid chest with always an abdominal type of breathing, as in emphysema, and other chest diseases. In such cases I allowed a little ether to slowly dribble into the gas bag containing the warmed mixed gases, with the result that the narcosis deepened and perfect relaxation was thus obtained. During the stages of exploration of the abdomen, or pulling of the viscera, or suture of the peritoneum, to obtain the best results, the amount of nitrous oxide and ether is slightly increased, and that of oxygen proportionately decreased.

3. Much attention was devoted to premedication before anæsthesia with nitrous oxide and oxygen and, with a view to securing synergistic

[* Local claims for priority in the use of methods that have been in general use for a quarter of a century do not seem to us important. Boyle's pattern of 'gas'-oxygen-ether apparatus has however been used in the Medical College in Calcutta for major surgery for a dozen years at least.—EDITOR, I. M. G.]

action, some patients were given a non-depressant hypnotic the night before, a hypodermic of morphia gr. 1/6 and atropine sulphate gr. 1/100 one hour before the operation, a small dose of avertin (tribromethyl-alcohol) 0.06 gm. per kg. of body weight in 2½ per cent solution of distilled water per rectum half hour before operation, and then nitrous oxide and oxygen at the time of the operation, combined in certain cases with a very little ether, as stated above.

The cases done by this method, in which avertin was used in a small dose as a basal narcotic, required the administration of much less nitrous oxide to keep them well under than would be the case without any premedication, and so the above plan was found to be advantageous in cases of long operations where prolonged deep anaesthesia is required.

4. Some slight tendency to cyanosis was observed in 50 per cent of cases where morphia and avertin were given before the administration of nitrous oxide but it is quickly removed by the insertion of an air-way tube, keeping

the head slightly low, and the chin supported by a finger so that there is no sagging of the lower jaw.

5. If occasional rebreathing by the patient is allowed in the same bag, it was found to help in maintaining the carbon dioxide tension in the blood, and thereby to deepen the anaesthesia and also cause much saving of nitrous oxide gas.

6. When nearing the end of an operation, it has been my practice to administer carbon dioxide interruptedly to the patient, and in 75 per cent of cases the corneal reflex returned and the patient answered questions, even after an operation lasting two hours, before he was removed from the table. Therefore, as the unconsciousness is quickly regained, due to the blowing off of the nitrous oxide by increased pulmonary ventilation brought about by carbon dioxide, the effects of the anaesthetic on the system are quickly eliminated, which is an advantage.

7. With the above technique there have been found no toxic effects on the system, no serious complications nor sequelæ due to anaesthesia.

Medical News

LIEUT.-COL. ROBERT KNOWLES

AN APPRECIATION*

THERE are probably many Europeans living in Calcutta to-day who during the last sixteen years have never met Robert Knowles and did not even know him by sight, yet during this period he has not only held very responsible positions and played a very important part in the medical life of India's largest city, but has made the name of Knowles a household word in medical circles throughout India and in every country in the world where tropical diseases are studied.

Those who did meet him socially would certainly never describe him as a recluse; he was prepared to converse on almost any subject; he was a good raconteur, and an excellent after-dinner speaker, yet never verbose.

But he was always a man with a single purpose, and at no time was that purpose social success; it was always something much more closely associated with professional work; in later years it was the particular *magnum opus* that he was engaged on at the time, as he was always a most indefatigable author.

It was in Bombay in 1916 that the writer of this note first met Knowles. He had been badly wounded in the battle of Ctesiphon and had been passed unfit for further active military duty. The story, told by a fellow officer, of how he was sent down from Ctesiphon to Basra on a barge with hundreds of other wounded and took on the duties of medical officer, reflects very little credit on the medical organization in the opening days of that campaign, but gives a glimpse of that selfless determination in the presence of a severe physical handicap to do what he considered his duty, which was so characteristic of Knowles' last years.

Pasteur Institute

Soon after joining the service, which, incidentally, he entered at the top of his batch, Knowles had been placed in the comparatively new medical research

department where he met and worked with Acton, and carried out some work on snake venoms that is still referred to as the standard work on this subject. It was natural therefore that after serving for a short time as a bacteriological specialist in one of the war hospitals in Bombay he should be chosen to start the new Pasteur Institute that was to be opened in Shillong.

Out of the dry routine of a military bacteriological laboratory he had managed to find some subject for scientific investigation, and the untiring energy he displayed in the attempt to finish this, working fourteen hours a day, in a well-staffed hospital where four was considered an officer's normal quota, made a very great impression on the writer.

In Shillong he threw his whole heart into the work of organizing the new Institute in conditions that were far from favourable. At that time enemy submarines were very active and every ship in which his equipment was coming out appeared to be a special mark for the enemy, so that in some instances he had to indent three times before he obtained what he wanted. However, before the end of the War he had established it not only as a Pasteur Institute but as a research centre where some pioneer work was carried out in the treatment of kala-azar, at that time a deadly epidemic in Assam.

Successor to Rogers

It was at this time that Knowles attracted the attention of Sir Leonard Rogers who was raising funds and persuading the Government of Bengal to establish a School of Tropical Medicine in Calcutta.

Sir Leonard was compelled to retire on account of ill health and he chose Knowles as his successor, both as Professor of Pathology at the Medical College and as organizer of the School of Tropical Medicine. He only held the former post for a few months as it was quite obvious that the work of starting the School was more than a whole-time job; he was appointed in the summer of 1920 as secretary of the School, the first member of its staff. Here again he displayed the same enthusiasm as he did for everything he undertook, and in this case

* From the *Statesman*, 5th August, 1936.

he managed to instil in others his enthusiasm for this great project. He went round Clive Street daily and persuaded the war-time captains of commerce to part with some of their wealth with such success that he tells the story of how he once returned with a lakh and a half of rupees in his pocket, and says he was sorely tempted to get on to the next boat leaving India!

When the School was eventually opened at the end of that year he was appointed Professor of Protozoology. This appointment he has held ever since. Much of the success of the School and the name that it has made have been due to his work. Here he again became associated with Acton. They formed an ideal team of workers. Acton provided the brilliant ideas and Knowles worked them out and brought them into fruition.

Knowles is often spoken of as a great writer, and so he was, but behind his writing there was always a great deal of hard work. No one could summarize the work that had been done on any subject better than Knowles, but then he only did this when he had some of his own work to add; his work on kala-azar, dysentery and malaria, to mention only a few of the subjects he tackled, is known throughout the world, and on the last two subjects he has written books that are standard works of reference on the subjects.

Ill health

On many occasions Knowles acted as Director of the School of Tropical Medicine, and when Col. Acton died he would almost certainly have been appointed Director had his health allowed it, but during the last four years of his service his health failed very badly; overwork was undoubtedly the cause of this. At the end of 1931 he went home sick and few of us expected that he would ever come out again, but he would never give in and he returned to work in the summer of the next year. He was far from well, but he struggled on and carried out some very important work on malaria.

He again went home sick at the end of 1932 and this time we were all certain that he would not return, but again he defeated our gloomy prognostications and once more he returned to duty. Since then he has carried on in the face of terrible ill health. He earned his full pension some years ago and any ordinary man would have been content to have gone home to enjoy it, but he had an overwhelming sense of duty and he felt that he must stand by the School while he was able to stand up and deliver his lectures.

Col. Acton's death merely made him more determined that his presence was necessary. During the summer vacation this year he was so ill that he was unable to attend the School; he was bitterly disappointed when the term began and he had to ask for a fortnight's leave. This leave expired on 31st July and although his medical adviser begged him not to get up—forbidding him was useless as he had so frequently defied his medical advisers and had invariably triumphed—he went to the School on 1st August.

About midday on Sunday he again became seriously ill; he was taken into hospital the same evening, and passed peacefully away in his sleep in the early hours of yesterday morning. He had made up his mind that he would die 'on duty', and he did; as far as official records show he was on duty from 1st August and he died before it was necessary to apply for further leave. And so passed a man of outstanding ability and exceptional character.

FIRST INTERNATIONAL CONFERENCE ON FEVER THERAPY

POSTPONEMENT NOTICE

This conference, originally scheduled for the end of September 1936, as notified in our July issue, has been postponed, because of numerous requests, to permit more time for the preparation of material. The new dates set for this conference are 30th March to 2nd April, 1937. The sessions will be held at the College of Physicians and Surgeons, Columbia University, New York City.

SECOND ALL-INDIA OBSTETRIC AND GYNÆCOLOGICAL CONGRESS

THE second All-India Obstetric and Gynæcological Congress will be held in Bombay about Xmas 1937.

The following are subjects selected for the main discussions:—

(a) Toxæmia of pregnancy.

(b) Cancer of cervix.

The exact time and programme will be notified in due course.

Joint Honorary Secretaries,

Bombay Obstetric and Gynæcological Society.

SANDHURST ROAD,
RAJ BHUVAN,
BOMBAY 4.

BRITISH SOCIAL HYGIENE COUNCIL

ANNUAL GENERAL MEETING

Wednesday, 17th June, 1936

Address by

THE RT. HON. SIR KINGSLEY WOOD, M.P.,
Minister of Health

SIR KINGSLEY WOOD, the Minister of Health, was the principal speaker at the Annual General Meeting of the British Social Hygiene Council held at the London School of Hygiene and Tropical Medicine on Wednesday, 17th June, when the Rt. Hon. L. S. Amery, M.P., took the chair.

In opening the address, Sir Kingsley emphasized the importance of prevention of sickness and disease, and it seemed to him that one of the most cheering and significant signs of the times was the attitude of mind of the younger generation towards health and recreation.

The Minister then went on to speak of the activities of the British Social Hygiene Council. As head of the Ministry of Health he wished to testify to the good work which the council had done and was doing, and to promise his constant support so far as it lay within his power to give it. He pointed out that it was useless to provide facilities for the treatment of venereal disease unless the persons affected were constantly stimulated to use them to the fullest extent. Education and public enlightenment were necessary, and it was in this connection that the work of the council was so important. He was ready to further the work from the financial side, so far as he could, because expenditure on propaganda undoubtedly reduced expenditure on treatment.

In this country the view was taken in regard to the treatment of venereal disease that any element of compulsion was likely to defeat its own object. Treatment was therefore provided free, it was given under conditions of secrecy, and the treatment centres were open to all comers irrespective of their place of residence. Few people realized the economic loss to the country occasioned by the disease. It was impossible to give exact figures but it was incontestable that the elimination of syphilis would mean the elimination of two diseases—general paralysis of the insane and locomotor ataxy, which accounted between them for over 1,600 deaths in 1934. Syphilis accounted also for an important proportion of heart disease that killed through sudden death many between the ages of 30 and 60.

Results generally were improving. The public efforts made during the last 20 years to educate the public had certainly resulted in a more general realization of the dangers and of the importance of seeking medical advice at an earlier date. Persons attending the treatment centres continued their attendance for a longer period than they did in earlier days and an increasing number took advantage of the facilities for diagnosis now available. The incidence of syphilis was on the decline, the recent infections dealt with at the treatment centres in 1935 were just under 6,000 as compared

with something over 9,000 in 1925, while the mortality of infants certified as due to the disease in 1934 was less than one-half of what it was in 1924 and about one-sixth of that in 1917.

It was not possible to make any exact statement as to the incidence of gonorrhœa, but there was no doubt that the propaganda work particularly was bearing fruit. There had been a substantial increase in the number of attendances by patients at the outpatient departments of the treatment centres. In 1925 the attendances numbered some 1,700,000; in 1935 there were nearly 3,400,000—an indication that patients were realizing the importance of persisting with treatment.

So far as discharge and tests of cure after treatment were concerned there was an improvement, for in 1925 the percentage was 12.9 whilst in 1935 the figure had risen to 17.5. The Minister commended laboratory work which was so important in connection with venereal disease, and stated that there were over 90 approved laboratories at which 632,000 tests were made in 1935.

There were certain matters to which it was important renewed efforts should be directed. The number of women attending the treatment centres would appear to be less than it should be. It was important to encourage those in charge of children who were unfortunately affected to bring them for observation and treatment to the centres. Undoubtedly the results of congenital syphilis might, in later life, be very serious—partial or complete blindness, deafness and mental deficiency. No new medical discovery was needed to rid the community of congenital syphilis. It could be prevented with practical certainty in every case by proper treatment of the prospective mother during her period of pregnancy. There was also need for the development of the work in rural areas including the local provision of treatment facilities.

In concluding, Sir Kingsley said that recognizing the valuable work the council had done in the past, he hoped there would be another successful 12 months. He assured his audience once again that to the best of his ability and within his power he would be very glad to do anything to help the council in its good work.

FELLOWSHIPS FOR RESEARCH IN TROPICAL MEDICINE

THE Medical Research Council, advised by the tropical medical research committee which they have recently appointed after consultation with the Colonial Office, announce that:

Three *junior fellowships* are offered immediately for award to qualified medical men wishing to receive training with a view to careers in research work in tropical medicine. Preference will be given to candidates who have already had preliminary experience of methods of research. Subject to satisfactory reports, the fellowships will be tenable for three years, the first to be spent at a school of tropical medicine, the second in research at some institution at home, and the third largely in work under direction at some centre in the tropics. The stipend will be at the rates of £300, £400 and £500 per annum in the successive years, with an additional allowance during service abroad and necessary expenses.

In three years' time a *senior fellowship* for a further period of three years' research work in the tropics at £600 rising to £750 per annum, with an allowance and expenses, will be available for at least one of the junior fellows. The council are also prepared to consider immediate applications for senior fellowships from candidates who have had adequate experience in research work not necessarily in tropical medicine.

Permanent appointments.—The council intend to establish in due course, as suitable investigators become available as the result of the fellowships scheme, permanent and pensionable appointments for research work in tropical medicine, including senior posts. Members of this research staff will work partly in the tropics and partly at home. The exact terms of service are still

undecided, but they will be not less favourable than those which apply to other Government appointments at home or overseas for men of similar professional standing.

Inquiries may be addressed to the Secretary, Tropical Medical Research Committee, 38, Old Queen Street, London, S.W.1, with whom applications should be lodged not later than 1st October, 1936.

THE ROCKEFELLER FOUNDATION

According to an annual report just published, the Rockefeller Foundation in 1935 expended \$12,725,439. President Max Mason commented on the work for the year as follows:

'During the year the Foundation has continued its efforts in public health through the International Health Division. Financial assistance and the co-operation of its staff have supplemented governmental agencies in the training of public health personnel and in the control of disease, while the staff has continued its study of certain diseases in their environments, and also the laboratory research to which this study leads.

'The programme in China has placed emphasis on organized efforts at rural reconstruction through aid to concrete studies and the training of personnel.

'The remaining appropriations have been made, in minor part, to terminate the support of older interests of the Foundation, and, in major part, to carry on work in the following fields: (1) social structure and functioning; (2) individual behaviour; (3) individual and race development; (4) cultural appreciation and expression.

'In the field of social structure and functioning the Foundation has placed its emphasis on three groups of problems—those having to do with international relations, social security, and public administration. Support has been given to objective, realistic studies promising results of practical significance. The difficulty of obtaining such results is admittedly great, but the stakes are so important that they justify sustained and carefully directed effort.

'Problems of individual behaviour and race development were attacked through the programmes of the medical sciences and the natural sciences. Work in mental health was furthered through the medical sciences, particularly by aid to the teaching of psychiatry and to the study of the complex phenomena of mental disease and maladjustment. Through the natural sciences projects were assisted which focused the techniques of the exact sciences upon research important for understanding human development, and for furnishing the basis of much of the research in psychiatry.

'Certain types of cultural activities were selected for the work in the humanities, with the aim of extending public appreciation and participation, and fostering international cultural understanding'.

The expenditure was made under the various headings, Public Health, Natural Sciences, Social Sciences, Humanities and Medical Sciences: further details of the last-named are given below:—

MEDICAL SCIENCES

During 1935 the Rockefeller Foundation appropriated \$2,733,050 for work in the field of medical science. Of this sum, \$1,459,450 was contributed to projects for the advancement of psychiatry.

For the development of teaching and research in psychiatry grants were made to the Institute for Psychoanalysis, Chicago; the Johns Hopkins University School of Medicine, for teaching in child psychiatry; the Institute of the Pennsylvania Hospital, for training in psychiatry; the Harvard Medical School and the Massachusetts General Hospital, for a joint programme in psychiatric training; the University of Michigan Medical School, to extend the scope of psychiatric training; the School of Medicine of the University of Colorado, for the teaching of psychiatry in medical, surgical and obstetrical clinics; and to the University of Chicago School of Medicine, to establish and maintain a sub-department of psychiatry.

A contribution toward a laboratory building was given to the National Hospital, Queen Square, London.

Fourteen research undertakings in clinical psychiatry and related fields received grants ranging in duration from one year to five years, and in amount from \$5,000 to \$90,000. The institutions and fields of work thus aided were: Maudsley Hospital, London, research in psychiatry; University of London, Galton Laboratory, studies in human genetics in relation to mental disease; Columbia University, College of Physicians and Surgeons, psychiatric research; University of Amsterdam and the Worcester State Hospital, Massachusetts, research on dementia præcox; Cornell University Medical College, studies of reflex behaviour; University of Chicago, study of the physiology of sleep; Northwestern University Medical School, research in neuro-anatomy; New York University College of Medicine, research in experimental neurology; Dartmouth College Medical School, research in physiological optics; University of Pennsylvania School of Medicine, research on growth of living tissues; Harvard Infantile Paralysis Commission, field studies in North Carolina; Chicago Area Project, field study of abnormal behaviour; and the Institute of the Educational Sciences, Geneva, Switzerland, research in child psychology.

In connection with the application of modern psychiatric knowledge, grants were made to the National Committee for Mental Hygiene, in New York City, the North Carolina Commission for the Study of the Care of the Insane and Mental Defectives, and the Massachusetts Department of Mental Diseases.

During the year the Foundation administered seventy-two fellowships in the medical sciences.

THE LEISHMAN MEMORIAL PRIZE

MAJOR J. S. K. BOYD, Royal Army Medical Corps, has been awarded the Leishman Memorial Prize for the year 1935, consisting of a silver medal and a sum of £30.

The Leishman Prize (Officers) is awarded annually to an officer of the Royal Army Medical Corps, or of the Army Dental Corps, for work of outstanding merit.

NORTH PERSIAN FORCES MEMORIAL MEDAL

A. A. FORBES BROWN, Esq., M.D., D.T.M. & H., Colonial Medical Service, has been awarded the North Persian Forces Memorial Medal for the year 1935 for his paper on 'The Ulcer Syndrome in Tropical Africa' published in the *Journal of Tropical Medicine and Hygiene*.

The North Persian Forces Memorial Medal is awarded annually for the best paper on Tropical Medicine or Hygiene published in any journal during the preceding twelve months by a medical officer, of under twelve years' service, of the Royal Navy, Royal Army Medical Corps, Royal Air Force, Indian Medical Service, or Colonial Medical Service.

THE ALEXANDER MEMORIAL PRIZE

MAJOR J. BIGGAM, M.C., Royal Army Medical Corps, has been awarded the Alexander Memorial Prize for the year 1935, consisting of a gold medal and a sum of £40.

The Alexander Memorial Prize is awarded annually to an officer of the Royal Army Medical Corps for professional work of outstanding merit.

DR. HERCULANO DESA'S SILVER JUBILEE PRIZE

TO BE AWARDED BY THE BOMBAY OBSTETRIC AND GYNÆCOLOGICAL SOCIETY

The following subject is selected for the competitive thesis for the above prize for the year 1936-37:—

VARIATION OF UTERINE ACTION IN LABOUR

Terms of the Prize.

1. The prize is open to all medical persons registered by the Bombay Medical Council, who shall not be of more than five years' standing.

2. The thesis must be sent in five typed copies so as to reach the Honorary Secretaries, Bombay Obstetric and Gynæcological Society, Raj Bhuvan, Sandhurst Road, Bombay, on or before the 15th March, 1937.
3. The thesis should be designated by a motto instead of the writer's name and should be accompanied by a sealed cover containing the name of the competitor and his post office address. The name of the prize, the year of competition, the subject of the thesis and the writer's motto should be superscribed on the cover.
4. No study, essay or thesis that has been published in the medical press or elsewhere shall be considered eligible for the prize.
5. The accepted thesis shall be the property of the Bombay Obstetric and Gynæcological Society.
6. All the theses shall be returned if not accepted provided the return postage expenses are paid in advance by the writer.
7. In the award of the prize to the successful candidate, the decision of the committee shall be final.
8. The prize shall be in the form of cash money and a certificate. The amount shall be approximately Rs. 125.
9. The Society may request the successful competitor to read his thesis at any of their meetings.
10. The prize shall be awarded at the Society's annual meeting.

Bombay Obstetric and Gynæcological Society,
Raj Bhuvan, Sandhurst Road, Bombay.

RAI SHAMBHU DAYAL SAHIB GOLD MEDAL

1. A gold medal called the 'Rai Shambhu Dayal Sahib Gold Medal' will be presented for the best prize essay on a public health subject to be announced each year.

2. The subject of the next essay is 'Suitable and cheapest food for villagers and personal hygiene in rural areas'.

3. The competition will be open to the general public, including the medical and the public health workers in the United Provinces.

4. The essay is to be written in simple Hindi and should not exceed 3,000 words in length.

5. Essays should reach the Medical Officer, Provincial Hygiene Institute, United Provinces, Lucknow, by 31st October, 1936.

6. The name and address of the competitor must be distinctly written on each essay submitted and the envelope should have the words 'prize essay' in the top left-hand corner.

7. The Director of Public Health, United Provinces, shall judge the merit of the essay and his decision with regard to the award of the medal shall be final.

8. No correspondence will be entered into on the subject of competition.

9. No essay will be returned.

COURSE IN ELEMENTARY HYGIENE FOR NON-MEDICAL PEOPLE PROCEEDING TO THE TROPICS

The Liverpool School of Tropical Medicine, whose object it is to train medical men in tropical diseases, has this year launched a fresh scheme of holding courses in elementary hygiene for men and women, without medical qualifications, who are proceeding to the tropics. In the past, short courses have been held from time to time for groups of nurses, missionaries and others taking up posts abroad. In future, the School is to hold regular courses, lasting four days, in February, June and October each year. The next and third course begins on 6th October and lasts for four days.

In a short course of this description, only the most elementary instruction in keeping healthy in the tropics can be given. But the course is at once simple, helpful

and interesting. The professors and lecturers of each department deal with the various subjects, which are illustrated by museum and laboratory demonstrations. An important section of the course is devoted to the prevention of malaria, a disease which alone produces more illness than any other. Instruction is also given on typhoid, dysentery and cholera, and on the various insects, worms and other animals which cause or transmit disease. Emphasis is laid on the precautions to be taken before leaving for the tropics, the kind of clothing to wear, the preservation of food and water, and many other problems which must be taken into consideration if a white man or woman is to lead a healthy life in the tropics.

The School feels that many of the firms employing young men and women abroad will realize the great value of such a course, both to themselves as well as to their employees. Those who are going to work on plantations and other estates, in mines, in engineering undertakings and other works abroad will find that they obtain useful information on how to keep fit. It is also of particular interest to missionary societies

and other institutions which are sending people out on their behalf. In fact, men and women in all walks of life who are contemplating either a short or a long stay in hot climates will find this short course of instruction of the utmost value to them.

THE 45TH CHEMISTS' EXHIBITION, LONDON

THE Chemists' Exhibition in London is one of the most important events of the year for the trade. The 45th will be held on 21st to 25th September next in the handsome new hall of the Royal Horticultural Society, Westminster, S.W. The management, 'The British and Colonial Pharmacist', is always pleased to welcome members of the drug trade from overseas and they are admitted on presentation of business cards. The exhibition—which in size and comprehensiveness is unequalled in the world—presents the latest products and attracts a very large attendance from chemists and druggists and all interested in the distribution of chemists' goods. Solely for the trade, it reflects the advance in the previous 12 months.

Current Topics

Mandelic Acid and Ammonium Mandelate in the Treatment of Urinary Infections

By H. E. HOLLING, M.B., M.Sc. (Sheff.),
M.R.C.P. (Lond.)

and

ROBERT PLATT, M.D. (Sheff.), F.R.C.P. (Lond.)
(Abstracted from the *Lancet*, Vol. I, 4th April, 1936,
p. 769)

Of the 21 hospital cases treated, 13 were inpatients and the remainder outpatients. There were also 8 private patients, 3 of whom were in bed during the treatment.

Catheter specimens of urine were first examined to determine the nature of the infection, and pyelography (retrograde or intravenous) was performed where necessary, to exclude pyonephrosis, calculus, tuberculosis, etc.

The first few hospital patients were given mandelic acid, neutralized by sodium bicarbonate as described by Rosenheim. Later the sodium salt was prescribed as follows:—

Sodium mandelate ..	..	50 grains.
Syrup of orange ..	..	1 drachm.
Water to 1 ounce.		

In water four times daily.

This was preceded by:—

Ammonium chloride ..	..	30 grains.
Liquid extract of liquorice ..	..	15 minims.
Water to 1 ounce.		

Four times daily.

Fluid intake was restricted during treatment to two pints daily, unless thirst was complained of, when more fluid was allowed.

The acidity of the urine, which must attain a pH of 5.3 or less, was tested by the addition of five drops of methyl-red solution to 2 c.cm. of urine. This gives a bright pink colour if the urinary acidity is satisfactory, but an orange or yellow colour if it is too alkaline. The amount of ammonium chloride administered was then increased or reduced accordingly. As

a rule, a satisfactory acidity can be produced with about half the dose prescribed above. In private patients the ammonium chloride was given in 1.0 gramme capsules (4 to 8 daily).

Finally, 4 cases were treated by ammonium mandelate (see later).

Specimens of urine were examined at two-day intervals where possible. When the deposit (examined as a wet film) showed only a few leucocytes and no bacilli, cultures were again made from catheter specimens.

COMMENT

The results of treatment are set out in the accompanying table, and it will be seen that in every uncomplicated case of acute or chronic pyelonephritis the urine was rendered sterile by mandelic acid treatment in from 2 to 21 days in 24 out of 29 cases. [The failures are reported in detail in the paper; they were all complicated cases with some underlying condition, such as tuberculosis and prostatic calculi or urinary infection was associated with some other condition, such as pernicious anaemia.]

During treatment a few casts and a trace of albumin occasionally occur in the urine. The treatment is obviously unsuitable in the presence of renal insufficiency because badly damaged kidneys cannot excrete a sufficiently acid urine or a sufficient concentration of mandelic acid. Nevertheless the presence of nephritis in an earlier stage does not appear to be a contra-indication, as is shown by the two cases in which renal oedema was present. The superimposed urinary infection was cleared up in each without any apparent change in the course of the nephritis. In a case of hypertension without renal insufficiency the course of the disease also was unaffected, except favourably by the removal of the symptoms of urinary infection.

In two cases relapse occurred; one was again successfully treated. Case 18 had previously had scarlatinal nephritis; intravenous pyelography showed slight stenosis of the right ureter and a ureteric catheter was therefore passed and kept in position for three days during mandelic acid treatment. Case 20 had had mandelic acid treatment at home once before and relapsed; she had a history of having had 'cystitis' at the age of 13 years. In cases 7, 13, 19, 22, 23 and 25 a recent acute pyelonephritis had been controlled by alkaline treatment, but a heavy infection still remained. Cases 10 and 14 were treated with mandelic acid in the acute stage.

SUMMARY OF CASES

No.	Sex and age	Organism	Diagnosis	Duration of infection	Days till urine sterile	REMARKS
1	F. 48	<i>B. coli</i>	C. pyelitis	2 years	7 days	Hypertension. Granular and hyaline casts.
2	F. 30	"	"	1½ weeks	6 "	Could not take ketogenic diet.
3	F. 26	"	Pyelitis and nephritis.	5 weeks	10 "	Subacute nephritis not affected by mandelic acid.
4	M. 53	"	C. pyelitis	1 year	Not sterile	? Prostatic calculi but no prostatic enlargement. Feels better on mandelic acid.
5	F. 49	"	"	?	3 weeks	—
6	F. 34	"	"	2 years	7 days	—
7	M. 28	"	A. pyelitis	—	14 "	Urine showed few hyaline and granular casts.
8	F. 5	"	C. pyelitis	6 months	4 "	Relapse after successful ketogenic diet.
9	F. 30	<i>B. coli</i> , T. B.	T. B. kidney and bladder.	6 "	Not sterile	No effect on secondary infection; refuses to take ammonium chloride.
10	M. 52	<i>B. coli</i>	A. pyelitis	4 days	4 days	—
11	F. 59	<i>B. coli</i> , staph. <i>B. proteus</i> .	Pyelitis and cystitis.	6 weeks	Not sterile	Had subacute combined degeneration.
12	F. 30	<i>B. coli</i>	C. pyelitis	3 years	5 "	Renal insufficiency.
13	F. 50	"	A. pyelitis	1 month	5 days	Relapse and cure in 10 days.
14	F. 25	"	"	1 week	10 "	—
15	F. 35	"	C. pyelitis	Many years	7 "	Mandelic acid made her sick and she refused it. Urine sterile but symptoms not improved.
16	M. 50	"	Pyonephrosis Pyonephrosis and perinephric abscess	?	Not sterile	Died of <i>B. coli</i> septicæmia.
17	M. 64	"	C. pyelitis	3 months	10 days	Cure, later relapsed.
18	F. 14	"	"	1 year	3 "	Kidney drained with catheter.
19	F. 45	"	A. pyelitis	24 days	2 "	—
20	F. 30	"	C. pyelitis	9 months	14 "	Previous attack cured in 14 days by mandelic acid.
21	F. 31	"	"	6 "	12 "	—
22	F. 21	"	"	5 weeks	14 "	Followed pregnancy.
23	F. 27	"	Pyelitis of pregnancy.	3 "	21 "	—
24	F. 37	"	C. pyelitis	10 "	14 "	—
25	F. 21	"	A. pyelitis	4 "	10 "	—
*26	M. 66	"	C. pyelitis	11 years	5 "	—
*27	F. 6	"	Pyelitis and nephritis.	?	5 "	Acute nephritis, improved during treatment.
*28	F. 53	"	C. pyelitis	Many years	4 "	—
*29	F. 35	"	"	Few years	7 "	Ammonium chloride and ammonium mandelate.

* Treated with ammonium mandelate. C. = chronic; A. = acute.

AMMONIUM MANDELATE

The only disadvantage of mandelic acid treatment as so far practised is the necessity of giving two somewhat unpleasant medicaments, one followed closely by the other, four times in the day. The ammonium chloride is particularly nauseous to some patients and may actually cause vomiting, and even when it is given in capsule form there may be an unpleasant after-taste.

Mandelic acid has to be given as a salt because the acid itself is a gastric irritant. The ammonium chloride is given to acidify the urine so that a proportion of the mandelate administered is excreted as mandelic acid.

To obviate these disadvantages if possible, the British Drug Houses Ltd. have prepared the ammonium salt of mandelic acid, and we are indebted to them for placing stocks at our disposal for clinical trial. They state that ammonium mandelate, being hygroscopic, cannot be supplied in tablet form and they have therefore made it up as an elixir, 1 oz. of which contains 34 grains of the salt, equivalent to 30 grains (2 grammes) of mandelic acid.

Salts such as ammonium chloride act as acids in the body owing to the ammonium radicle being converted

into urea, and leaving the acid radicle to be excreted. Ammonium mandelate should be weaker in its action than ammonium chloride, but on the other hand the use of ammonium mandelate dispenses with the necessity of giving the sodium salt, and so saves the addition of an unnecessary alkali. Based on molecular weights, 3.0 grammes of sodium mandelate plus 1.0 gramme of ammonium chloride (approximately the usual doses) should be roughly equivalent to the effect of 3.0 grammes of ammonium mandelate administered by itself.

It seems likely that, provided the urine can be sufficiently acidified by ammonium mandelate alone, the bacteriostatic effect of the mandelic acid radicle will be as good as when the sodium salt is used. We therefore tried the acidifying effect of the elixir of ammonium mandelate on ourselves (it is not particularly unpleasant to take) and found that doses of 34 grains of ammonium mandelate four times daily produced a satisfactory urinary acidity (pH 5.3) within an hour or two, but this degree of acidity was not invariably maintained throughout the day. As we are both of about average weight (10 st. 2 lb. and 10 st. 9 lb.) we concluded that somewhat larger doses should generally be given for the treatment of patients.

Four patients were treated with ammonium mandelate, and in all four a sterile urine was effected in a week or less, though all had a chronic infection. Case 26, a man of 13 st., required doses of 51 grains four times daily (1½ oz. of the elixir). Case 27, a child of 6 (weight 3 st. 7 lb.) with acute nephritis as well as *B. coli* infection, was given 17 grains four times daily. Case 28 had 34-grain doses. In case 29 the urine was alkaline to litmus before treatment, and 51-grain doses supplemented by 30 grains of ammonium chloride were necessary to produce a satisfactory acidity and cure the infection.

In the light of this short experience, together with what is already known of mandelic acid treatment, we feel justified in saying that ammonium mandelate, suitably prepared, is a convenient means of administering mandelic acid, and that in the majority of cases the use of ammonium chloride can thereby be obviated. The suitable dose of ammonium mandelate is probably the same as that of the sodium salt—namely, about 50 grains four times in the day, the equivalent of about 3 grammes of mandelic acid.

SUMMARY

Of 29 cases of urinary infection treated with mandelic acid 24 showed sterile urine within 2 to 21 days. Of the successful cases 2 had also a concurrent nephritis in an active stage, which was not adversely affected by the treatment. Of the 5 failures at least 3 were unsuitable cases in which cure was not to be anticipated.

Ammonium mandelate was found to be as effective as the sodium salt, and when it was used it was usually unnecessary to give the unpleasant ammonium chloride.

The proper use of these remedies will prevent chronic pyelonephritis.

A Simplified Treatment of Bacilluria

By A. L. CLARK, M.D.
and

B. F. KELTZ, M.D.

(From the *Journal of the American Medical Association*,
Vol. CIV, 26th January, 1935, p. 289)

FROM the work of William Mansfield Clark it has been shown that it is practically impossible to increase the acidity of the urine sufficiently by the oral administration of any drug to inhibit entirely the growth of the colon bacillus. Because of this it was decided to try the effect of altering the food intake. Barborka suggested that the ketogenic diet, which had been used originally by Wilder in the treatment of epilepsy, produced an acidity of the urine considerably above the normal. Previously, Johnson had placed several patients with a bacillary infection of the urinary tract on the ketogenic diet. He noted some improvement in their condition, but the patients were too ill to allow a thorough test of the treatment. About this time Helmholz had noted that the urine of a patient on the ketogenic diet for the treatment of epilepsy remained clear and apparently sterile, although it had been voided into an unsterile vessel and allowed to stand for a number of days.

To a patient who had returned to the Mayo Clinic a number of times for treatment of a persistent bacillary infection of the urinary tract belongs the real credit for making the ketogenic treatment available to the other sufferers of this ailment. During his fourth trip to the clinic in fourteen months he announced that he would stay until his condition was entirely relieved. At this visit, as before, many different types of treatment, both local and oral, were applied, with only temporary periods of improvement. The culture of the urine showed the infecting organism to be the colon bacillus. On 21st July, 1931, the patient was placed on the ketogenic diet. In five days his symptoms of burning, frequency and urgency of urination were relieved. In twelve days a culture of the urine revealed the absence of the colon bacillus. Refusing to believe in his good

fortune, because of his many periods of temporary relief in the past, he insisted that he be allowed to remain on the diet for ten more days. This patient has been followed for over two years since discontinuing this type of treatment and has not had a recurrence of the urinary tract infection. In August 1931 another patient was placed on the dietary treatment with very satisfactory results. Subsequently, Helmholz put several children who were suffering from infections of the urinary tract on the ketogenic diet and he also obtained excellent results.

In October 1931 one of us reported these first two cases at the staff meeting of the Mayo Clinic, and following this Helmholz presented his results. Since that time, the reports of a number of investigators who have used the ketogenic treatment in chronic urinary infections leave no question as to its definite therapeutic value. We wish to reiterate that urinary sepsis is frequently concomitant with other urologic conditions, such as obstruction, tumours and calculi. Necessarily, the management of these cases must include the early elimination of any such complications.

Up to the present time the ketogenic treatment has required the co-operation of a trained dietitian. In many cases this has necessitated hospitalization of the patient. Robb, reporting a carefully controlled series of cases, says in his conclusions: 'The results suggested that the ketogenic diet was an unsuitable form of treatment for outpatient departments'. Since accumulated data have shown a definite increase in satisfactory results obtained in this type of therapy, it would seem essential to simplify it to permit its application to office practice and outpatient departments.

To do this, we present the following simplified ketogenic treatment, which has been shown from our experience to be applicable to office practice. The diet may be prescribed without detailed dietetic knowledge by the physician and can be prepared in the average home without special dietetic supervision. The menus are so arranged that, regardless of the items selected from the different groups, the daily intake of food will consist of carbohydrates 15 to 20 gm., protein 35 to 50 gm., and fat 300 to 325 gm., with a ketogenic-antiketogenic ratio of approximately 4 to 1. The vitamin deficiency need not be considered, since the patient will be on the diet only a short period of time.

The simplified diet consists primarily of cream (40 per cent fat), mayonnaise, butter, eggs, bacon and vegetables containing 3 per cent carbohydrate. In group A are combinations of eggs and cream; group B gives a number of recipes for salads; group C is desserts, and group D contains the beverages that may be taken. The various items in each group have approximately the same carbohydrate, protein and fat content. The daily menu instructs the patient from which group selections are to be made for each meal.

How is the ketogenic diet effective in eradicating urinary sepsis? Two conditions are necessary. Sufficient concentration of ketone bodies must be present in the urine coincidental with an acidity of the urine of pH 5.2 or less if satisfactory results are to be obtained. Fuller has shown that laevo-rotatory beta-oxybutyric acid is the ketone body producing the greatest bacteriostatic effect. Helmholz and Osterberg were able to demonstrate the bactericidal effect of 0.5 per cent of 5.2 and a beta-oxybutyric acid content of 0.5 per cent. Recent work by Clark, Moore and Harrell, however, indicates that at a pH of 5.0 and a beta-oxybutyric acid content of the urine up to 1.5 per cent the effect of the urine is not sufficiently bactericidal to inhibit entirely the growth of the organisms. As the average beta-oxybutyric acid content of the urine of an adult patient on the ketogenic diet will not exceed a concentration of 1.2 per cent and the average acidity of the urine will not be greater than pH 5.0, it is probable that the action of the ketogenic treatment is one of bacteriostasis. It is important that this bacteriostatic effect be continuous and be maintained as uniformly maximum as possible during the entire twenty-four

hours. Only in this way will the last organism be washed from the urinary tract.

The simplified ketogenic diet

Group A: Egg Dishes

- | | | | |
|---------------------------|----|----|------------------|
| I. Egg nog | | | |
| Egg | .. | .. | 1 |
| * Cream (40 per cent fat) | .. | .. | 6 tablespoonfuls |
| Water | .. | .. | 5 " |
| Nutmeg | .. | .. | to taste |
| II. Scrambled eggs | | | |
| Eggs | .. | .. | 2 |
| * Cream (40 per cent fat) | .. | .. | 7 tablespoonfuls |
| Butter | .. | .. | 3 teaspoonfuls |
| III. Egg omelet | | | |
| Eggs | .. | .. | 2 |
| * Cream (40 per cent fat) | .. | .. | 6 tablespoonfuls |
| Butter | .. | .. | 3 teaspoonfuls |
| IV. Egg custard | | | |
| Eggs | .. | .. | 2 |
| Egg yolk | .. | .. | 1 |
| * Cream (40 per cent fat) | .. | .. | 7 tablespoonfuls |
| Vanilla | .. | .. | 2 drops |

Group B: Salads

- | | | | |
|--------------------------|----|----|--------------------|
| I. Lettuce salad | | | |
| Lettuce | .. | .. | $\frac{1}{2}$ head |
| † Mayonnaise | .. | .. | 4 tablespoonfuls |
| II. Lettuce and tomato | | | |
| Lettuce | .. | .. | $\frac{1}{2}$ head |
| Tomato | .. | .. | 1 small |
| Hardboiled egg | .. | .. | 1 yolk |
| Mayonnaise | .. | .. | 5 tablespoonfuls |
| III. Asparagus | | | |
| Asparagus | .. | .. | 6 stalks |
| Lettuce | .. | .. | few leaves |
| Mayonnaise | .. | .. | 4 tablespoonfuls |
| IV. Combination | | | |
| Lettuce | .. | .. | few leaves |
| Celery hearts | .. | .. | 2 |
| American cheese (grated) | .. | .. | 2 tablespoonfuls |
| Mayonnaise | .. | .. | 4 " |
| V. Egg salad | | | |
| Lettuce | .. | .. | few leaves |
| Egg (deviled) | .. | .. | 1 |
| Mayonnaise | .. | .. | 4 tablespoonfuls |

Group C: Cream Desserts

- | | | | |
|---|----|----|------------------|
| I. Bavarian cream | | | |
| Gelatin | .. | .. | 1 teaspoonful |
| * Cream (40 per cent fat) | .. | .. | 7 tablespoonfuls |
| Whip the cream. Soak the gelatin in 1 teaspoonful of cold water; dissolve in 2 teaspoonfuls of hot water. Add 2 drops of any flavoring. When cooled, add to cream. Place in mold and chill. | | | |

*It is of the utmost importance to use extra thick cream containing at least 40 per cent fat. The average whipping cream is only about 32 per cent fat.

† Recipe for mayonnaise:

- | | | | |
|-----------|----|----|------------------|
| Egg | .. | .. | 1 |
| Vinegar | .. | .. | 2 tablespoonfuls |
| Salad oil | .. | .. | 1 pint |
| Salt | .. | .. | 2 teaspoonfuls |
| Mustard | .. | .. | 1 teaspoonful |
| Pepper | .. | .. | few grains |

Have ingredients cold. Beat egg until stiff. Add dry ingredients. Add oil drop by drop, beating constantly. Thin with vinegar to the desired consistency.

II. Gelatin

Make plain gelatin as in I.
Use 7 tablespoonfuls of unsweetened whipped cream over it.

III. 7 tablespoonfuls of cream, whipped with or without flavoring.

Group D: Beverages

Tea, coffee or water with 4 tablespoonfuls of cream. If desired, this amount of cream may be used with 2 cups of the beverage. Use no sugar or milk.

Daily menu

Breakfast

- I. One choice from group A.
- II. One choice from group D.
- III. 8 slices of thin crisp bacon or 4 tablespoonfuls of cream (40 per cent fat).

Dinner and supper

- I. One choice from group B.
- II. One choice from group A or C.
- III. One choice from group D.

In some cases it may be impossible for the patient to have specially prepared menus. Satisfactory results will be obtained if one and one-half pints of cream (40 per cent fat) and six eggs are prescribed as the daily food intake. The recipes and suggestions in groups A and D may be used.

Important instructions to patient

1. Satisfactory results cannot be obtained unless this diet is followed absolutely as outlined. Even the smallest deviations will ruin the chance for success of this treatment.
2. No food or beverage other than that listed is to be taken.
3. Water may be taken in moderate quantities as desired.
4. The chewing of gum or tobacco is not permitted. Smoking is allowed.
5. No cathartics are to be used other than liquid petrolatum or bitter cascara. Magnesium magma or other sweet cathartics may cause failures.
6. Do not take any medicines unless prescribed by the physician. It may conflict with the diet.

Experience has shown that the patient who quickly develops and maintains an intense ketosis is greatly benefited in a short time. Ketosis should develop within three to five days. At the end of ten or twelve days, whether or not the results have been satisfactory, a mixed diet should be resumed. Several short courses of the dietary treatment are preferable to one long course. Certain patients will put through the ketone products in the urine much more quickly than others. To maintain a continuous ketonuria it may be necessary to space the intake of fat more evenly. This may be done by supplementary feedings of cream (40 per cent fat) between meals, especially between the evening meal and breakfast. During the treatment the physician should not be alarmed if the patient is nauseated. It may cause the patient to miss one or more meals without interfering with the desired results. Experience has shown that normal exercise and activity will lessen anorexia. Only the normal fluid intake should be prescribed. To force fluids will lessen the bacteriostatic effect by diluting the ketone bodies in the urine.

DAILY TESTS

Evidence of ketosis is based on the test for diacetic acid in the urine. If it is present, equal parts of a 10 per cent aqueous solution of ferric chloride and the patient's urine give a port wine color. It must be remembered that a patient who is taking acetylsalicylic acid will give a false positive test. The tests for diacetic acid and acidity of the urine should be made daily. Herrold suggests a most useful procedure for an approximate measure of the acidity, which may be

Four patients were treated with ammonium mandelate, and in all four a sterile urine was effected in a week or less, though all had a chronic infection. Case 26, a man of 13 st., required doses of 51 grains four times daily (1½ oz. of the elixir). Case 27, a child of 6 (weight 3 st. 7 lb.) with acute nephritis as well as *B. coli* infection, was given 17 grains four times daily. Case 28 had 34-grain doses. In case 29 the urine was alkaline to litmus before treatment, and 51-grain doses supplemented by 30 grains of ammonium chloride were necessary to produce a satisfactory acidity and cure the infection.

In the light of this short experience, together with what is already known of mandelic acid treatment, we feel justified in saying that ammonium mandelate, suitably prepared, is a convenient means of administering mandelic acid, and that in the majority of cases the use of ammonium chloride can thereby be obviated. The suitable dose of ammonium mandelate is probably the same as that of the sodium salt—namely, about 50 grains four times in the day, the equivalent of about 3 grammes of mandelic acid.

SUMMARY

Of 29 cases of urinary infection treated with mandelic acid 24 showed sterile urine within 2 to 21 days. Of the successful cases 2 had also a concurrent nephritis in an active stage, which was not adversely affected by the treatment. Of the 5 failures at least 3 were unsuitable cases in which cure was not to be anticipated.

Ammonium mandelate was found to be as effective as the sodium salt, and when it was used it was usually unnecessary to give the unpleasant ammonium chloride.

The proper use of these remedies will prevent chronic pyelonephritis.

A Simplified Treatment of Bacilluria

By A. L. CLARK, M.D.

and

B. F. KELTZ, M.D.

(From the *Journal of the American Medical Association*, Vol. CIV, 26th January, 1935, p. 289)

From the work of William Mansfield Clark it has been shown that it is practically impossible to increase the acidity of the urine sufficiently by the oral administration of any drug to inhibit entirely the growth of the colon bacillus. Because of this it was decided to try the effect of altering the food intake. Barborka suggested that the ketogenic diet, which had been used originally by Wilder in the treatment of epilepsy, produced an acidity of the urine considerably above the normal. Previously, Johnson had placed several patients with a bacillary infection of the urinary tract on the ketogenic diet. He noted some improvement in their condition, but the patients were too ill to allow a thorough test of the treatment. About this time Helmholtz had noted that the urine of a patient on the ketogenic diet for the treatment of epilepsy remained clear and apparently sterile, although it had been voided into an unsterile vessel and allowed to stand for a number of days.

To a patient who had returned to the Mayo Clinic a number of times for treatment of a persistent bacillary infection of the urinary tract belongs the real credit for making the ketogenic treatment available to the other sufferers of this ailment. During his fourth trip to the clinic in fourteen months he announced that he would stay until his condition was entirely relieved. At this visit, as before, many different types of treatment, both local and oral, were applied, with only temporary periods of improvement. The culture of the urine showed the infecting organism to be the colon bacillus. On 21st July, 1931, the patient was placed on the ketogenic diet. In five days his symptoms of burning, frequency and urgency of urination were relieved. In twelve days a culture of the urine revealed the absence of the colon bacillus. Refusing to believe in his good

fortune, because of his many periods of temporary relief in the past, he insisted that he be allowed to remain on the diet for ten more days. This patient has been followed for over two years since discontinuing this type of treatment and has not had a recurrence of the urinary tract infection. In August 1931 another patient was placed on the dietary treatment with very satisfactory results. Subsequently, Helmholtz put several children who were suffering from infections of the urinary tract on the ketogenic diet and he also obtained excellent results.

In October 1931 one of us reported these first two cases at the staff meeting of the Mayo Clinic, and following this Helmholtz presented his results. Since that time, the reports of a number of investigators who have used the ketogenic treatment in chronic urinary infections leave no question as to its definite therapeutic value. We wish to reiterate that urinary sepsis is frequently concomitant with other urologic conditions, such as obstruction, tumours and calculi. Necessarily, the management of these cases must include the early elimination of any such complications.

Up to the present time the ketogenic treatment has required the co-operation of a trained dietitian. In many cases this has necessitated hospitalization of the patient. Robb, reporting a carefully controlled series of cases, says in his conclusions: 'The results suggested that the ketogenic diet was an unsuitable form of treatment for outpatient departments'. Since accumulated data have shown a definite increase in satisfactory results obtained in this type of treatment compared with those of other types of therapy, it would seem essential to simplify it to permit its application to office practice and outpatient departments.

To do this, we present the following simplified ketogenic treatment, which has been shown from our experience to be applicable to office practice. The diet may be prescribed without detailed dietetic knowledge by the physician and can be prepared in the average home without special dietetic supervision. The menus are so arranged that, regardless of the items selected from the different groups, the daily intake of food will consist of carbohydrates 15 to 20 gm., protein 35 to 50 gm., and fat 300 to 325 gm., with a ketogenic-antiketogenic ratio of approximately 4 to 1. The vitamin deficiency need not be considered, since the patient will be on the diet only a short period of time.

The simplified diet consists primarily of cream (40 per cent fat), mayonnaise, butter, eggs, bacon and vegetables containing 3 per cent carbohydrate. In group A are combinations of eggs and cream; group B gives a number of recipes for salads; group C is desserts, and group D contains the beverages that may be taken. The various items in each group have approximately the same carbohydrate, protein and fat content. The daily menu instructs the patient from which group selections are to be made for each meal.

How is the ketogenic diet effective in eradicating urinary sepsis? Two conditions are necessary. Sufficient concentration of ketone bodies must be present in the urine coincidental with an acidity of the urine of pH 5.2 or less if satisfactory results are to be obtained. Fuller has shown that *l*-oxybutyric acid is the ketone body producing the greatest bacteriostatic effect. Helmholtz and Osterberg were able to demonstrate the bactericidal effect of urine with a pH of 5.2 and a *l*-oxybutyric acid content of 0.5 per cent. Recent work by Clark, Moore and Harrell, however, indicates that at a pH of 5.0 and a *l*-oxybutyric acid content of the urine up to 1.5 per cent the effect of the urine is not sufficiently bactericidal to inhibit entirely the growth of the organisms. As the average *l*-oxybutyric acid content of the urine of an adult patient on the ketogenic diet will not exceed a concentration of 1.2 per cent and the average acidity of the urine will not be greater than pH 5.0, it is probable that the action of the ketogenic treatment is one of bacteriostasis. It is important that this bacteriostatic effect be continuous and be maintained as uniformly maximum as possible during the entire twenty-four

hours. Only in this way will the last organism be washed from the urinary tract.

The simplified ketogenic diet

Group A: Egg Dishes			
I. Egg nog			
Egg	..	1	
* Cream (40 per cent fat)	..	6	tablespoonfuls
Water	..	5	"
Nutmeg	..	to taste	
II. Scrambled eggs			
Eggs	..	2	
* Cream (40 per cent fat)	..	7	tablespoonfuls
Butter	..	3	teaspoonfuls
III. Egg omelet			
Eggs	..	2	
* Cream (40 per cent fat)	..	6	tablespoonfuls
Butter	..	3	teaspoonfuls
IV. Egg custard			
Eggs	..	2	
Egg yolk	..	1	
* Cream (40 per cent fat)	..	7	tablespoonfuls
Vanilla	..	2	drops

Group B: Salads

I. Lettuce salad			
Lettuce	..	1	head
† Mayonnaise	..	4	tablespoonfuls
II. Lettuce and tomato			
Lettuce	..	1	head
Tomato	..	1	small
Hardboiled egg	..	1	yolk
Mayonnaise	..	5	tablespoonfuls
III. Asparagus			
Asparagus	..	6	stalks
Lettuce	..	few	leaves
Mayonnaise	..	4	tablespoonfuls
IV. Combination			
Lettuce	..	few	leaves
Celery hearts	..	2	
American cheese (grated)	..	2	tablespoonfuls
Mayonnaise	..	4	"
V. Egg salad			
Lettuce	..	few	leaves
Egg (deviled)	..	1	
Mayonnaise	..	4	tablespoonfuls

Group C: Cream Desserts

I. Bavarian cream			
Gelatin	..	1	teaspoonful
* Cream (40 per cent fat)	..	7	tablespoonfuls
Whip the cream. Soak the gelatin in 1 teaspoonful of cold water; dissolve in 2 teaspoonfuls of hot water. Add 2 drops of any flavoring. When cooled, add to cream. Place in mold and chill.			

*It is of the utmost importance to use extra thick cream containing at least 40 per cent fat. The average whipping cream is only about 32 per cent fat.

† Recipe for mayonnaise:

Egg	..	1	
Vinegar	..	2	tablespoonfuls
Salad oil	..	1	pint
Salt	..	2	teaspoonfuls
Mustard	..	1	teaspoonful
Pepper	..	few	grains

Have ingredients cold. Beat egg until stiff. Add dry ingredients. Add oil drop by drop, beating constantly. Thin with vinegar to the desired consistency.

II. Gelatin

Make plain gelatin as in I. Use 7 tablespoonfuls of unsweetened whipped cream over it.

III. 7 tablespoonfuls of cream, whipped with or without flavoring.

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Tea, coffee or water with 4 tablespoonfuls of cream. If desired, this amount of cream may be used with 2 cups of the beverage. Use no sugar or milk.

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Breakfast

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In some cases it may be impossible for the patient to have specially prepared menus. Satisfactory results will be obtained if one and one-half pints of cream (40 per cent fat) and six eggs are prescribed as the daily food intake. The recipes and suggestions in groups A and D may be used.

Important instructions to patient

1. Satisfactory results cannot be obtained unless this diet is followed absolutely as outlined. Even the smallest deviations will ruin the chance for success of this treatment.
2. No food or beverage other than that listed is to be taken.
3. Water may be taken in moderate quantities as desired.
4. The chewing of gum or tobacco is not permitted. Smoking is allowed.
5. No cathartics are to be used other than liquid petrolatum or bitter cascara. Magnesium magma or other sweet cathartics may cause failures.
6. Do not take any medicines unless prescribed by the physician. It may conflict with the diet.

Experience has shown that the patient who quickly develops and maintains an intense ketosis is greatly benefited in a short time. Ketosis should develop within three to five days. At the end of ten or twelve days, whether or not the results have been satisfactory, a mixed diet should be resumed. Several short courses of the dietary treatment are preferable to one long course. Certain patients will put through the ketone products in the urine much more quickly than others. To maintain a continuous ketonuria it may be necessary to space the intake of fat more evenly. This may be done by supplementary feedings of cream (40 per cent fat) between meals, especially between the evening meal and breakfast. During the treatment the physician should not be alarmed if the patient is nauseated. It may cause the patient to miss one or more meals without interfering with the desired results. Experience has shown that normal exercise and activity will lessen anorexia. Only the normal fluid intake should be prescribed. To force fluids will lessen the bacteriostatic effect by diluting the ketone bodies in the urine.

DAILY TESTS

Evidence of ketosis is based on the test for diacetic acid in the urine. If it is present, equal parts of a 10 per cent aqueous solution of ferric chloride and the patient's urine give a port wine color. It must be remembered that a patient who is taking acetylsalicylic acid will give a false positive test. The tests for diacetic acid and acidity of the urine should be made daily. Herrold suggests a most useful procedure for an approximate measure of the acidity, which may be

quickly and easily done in the office. To 20 drops of the patient's urine, one drop of 0.04 per cent solution of chlorphenol red is added. If the color of the urine remains the same, it is safe to assume that the acidity is pH 5.2 or less. After the addition of the indicator, if the solution becomes faintly pink or red, the acidity is above pH 5.2 and indicates that further measures for acidification of the urine will be necessary to obtain satisfactory results.

A stain of the urine sediment should be made every other day. After three tests have shown that the bacillus is apparently no longer present in the urine, the treatment may be discontinued. The final test, of course, is whether or not the bacillus is found in the urine after the patient has returned to a general mixed diet and the ketone bodies have disappeared from the urine. When one can follow the progress of the patient conveniently, microscopic examinations of the urine will eliminate the need for cultures as the final test of a satisfactory result.

DRUGS

In prescribing the simplified ketogenic diet, we have found it advisable to give no oral medication until ketone bodies have appeared in the urine. At that time, if the acidity of the urine is above pH 5.2, it may be advisable to give ammonium chloride orally to increase its acidity. Ammonium chloride 12 drachms (47 gm.) in 8 ounces (240 c.c.) of water makes a solution of which 2 fluid drachms (8 c.c.) in a glass of water may be given after each meal and at bedtime. This medication may upset the gastro-intestinal tract, in which case 15 grains (1 gm.) of the drug is given every two hours for six doses. The 15 grains is prepared in the form of two enteric coated tablets, each of 7½ grains (0.5 gm.).

In some cases tests will indicate that sufficient acidity has developed but that the percentage of ketone bodies in the urine is insufficient to produce the necessary bacteriostatic action. In such an instance, the oral administration of methenamine may increase the bacteriostatic power of the urine to a point at which the organism will be eliminated.

LOCAL TREATMENT

Hydrostatic lavage of the bladder with 1 : 2,000 solution of acetic acid or 1 : 8,000 solution of potassium permanganate may be instituted; but excellent results have been obtained without lavage, particularly in women. It should be remembered that the mechanical and chemical irritation of the catheter and lavage may offset the relief afforded by the ketogenic treatment. In male patients, a gentle massage of the prostate gland every second day is given to eliminate this as a focus of infection. In a number of cases in which there are resistant or recurring infections, urethroscopy may reveal dilated prostatic ducts leading from small chronic abscesses. As organisms from these foci may constantly reinfect the urine, drainage from such regions should be obtained by cystoscopically enlarging these ducts, as described by Thompson. In women, urethral cysts and small infected urethral glands should receive careful attention.

Frequently the coccic type of infection may be associated with the bacillary type. In these cases a short course of neosarsphenamine may be helpful; an intravenous injection of 0.3 gm. is given every five days for from four to six doses.

In prescribing the ketogenic treatment it must be remembered that the bacteriostatic agent must pass through the kidney. Poor renal function, particularly if unilateral, is a contra-indication for this type of treatment. In carefully observed cases it has been found that the ketone bodies will be largely excreted through the kidney with good function. There are two groups of cases for which we have no explanation as to the possible reasons for unsatisfactory results. One group will not develop a ketonuria, while in the second group the pH of the urine remains high, although large doses of some acidifying agent are administered.

SUMMARY

Applied in short courses, the simplified ketogenic treatment of bacillary infections of the urinary tract may be prescribed by the physician in the office or in the outpatient department with very satisfactory results.

The Prevalence of Vitamin A Deficiency among Iowa Children

By P. C. JEANS, M.D.

and

Z. ZENTMIRE, M.S.

(Abstracted from the *Journal of the American Medical Association*, Vol. CIV, 21st March, 1936, p. 996)

In 1934 we described a photometer test for dark adaptation which we believed useful in detecting vitamin A deficiency. Subjects with impaired ability to adapt to the dark were found to attain normal standards of dark adaptation after a period of vitamin A ingestion. The study that was reported seemed to establish the validity of the dark adaptation test as a test of vitamin A deficiency. With the photometer test being used as the criterion, a survey was made among Iowa school children in an endeavour to determine the frequency of vitamin A deficiency. This presentation is for the purpose of recording the results of the survey.

The first phase of the study, i.e., the original testing, was conducted in 1934 from February to April inclusive. The total group examined comprised 404 children from 6 to 15 years of age selected at random from rural, village and urban schools. The village selected was a county seat of approximately 2,000 population. The children of the rural group were from numerous small schools located within a 10-mile radius of the selected village; they were transported to the village for the test. All the village and rural children were examined in the same dark room and under the same standardized conditions. The urban children were in a city of approximately 150,000 population and were attending four different schools. Though the examinations were made in four different places, the conditions of the test were thoroughly standardized in each location. The urban children were classified according to the economic levels of their parents. Many of the families at the lowest economic level were receiving assistance.

The results of the survey are most readily comprehended by examination of table I. A distinction has been made between those with borderline subnormal and those with definitely subnormal dark adaptation. Considering only those definitely subnormal, it was found that the proportion having poor dark adaptation in the rural group was 26 per cent and in the village group 53 per cent; in the urban group the proportion in the upper economic level was 56 per cent, at the middle level 63 per cent and at the lowest level 79 per cent. Analysis of our data failed to reveal any relationship between vitamin A deficiency and either age or sex.

The results obtained were definite and clean cut and no obvious reason was apparent for doubting them. However, the proportion of subnormal results was so unexpectedly high that it was thought best to continue the study by re-examining some of the children after a period of vitamin A ingestion. An attempt was made to include in this second phase of the study all the rural and village children who had had borderline or definitely subnormal results at the first testing. For a period of several weeks either halibut liver oil or carotene in oil was administered each school day by the teachers. Those who did not show normal dark adaptation by the time school closed were given one of these products to use at home and at the same time we started bringing the children in small groups into the Children's Hospital and retaining them until normal dark adaptation was attained. Of the total group of ninety-nine rural and village children whose tests had shown abnormal results, all except twelve continued under

observation. The reasons for these twelve exceptions were illness, removal from the district or lack of co-operation. These twelve children did not receive a second test. Nine other children were observed and tested further but did not continue to the completion of their study. Six of these were dropped from the

TABLE I
Survey of Iowa school children as regards dark adaptation

Economic level	Number examined	Per cent normal	Per cent borderline sub-normal	Per cent definitely sub-normal
Rural				
Middle to low.	100	64	10	26
Village				
All levels	102	37	10	53
Urban				
Upper ..	70	34	10	56
Middle ..	70	27	10	63
Low ..	62	11	10	79

group because they refused to come to the hospital; the others were discharged from the hospital after a few days because of exigencies in the home. All nine of these children, however, showed definite and unmistakable improvement in dark adaptation before they went from under observation.

TABLE II
Results of retesting after administration of vitamin A

School	Number subnormal first test	AFTER ADMINISTRATION OF VITAMIN A OR CAROTENE			
		Not retested	Number normal	Number improved*	Number unimproved
Rural ..	36	9	24	3	0
Village ..	63	3	51	6	3
TOTALS ..	99	12	75	9	3†

* Only a brief period of observation permitted.

† After approximately six weeks of treatment.

The data presented in table II show that of the seventy-eight children who continued under observation only three failed to attain normal dark adaptation. These three remained in the hospital for from three to six weeks and it was impracticable to keep them longer. Careful ophthalmologic examination failed to reveal any abnormality that would account for the poor dark adaptation. It would be only conjecture to state that a protracted period of vitamin A deficiency may have produced a refractory state and that possibly a longer period of vitamin A ingestion would have brought about improvement. We have noted that the children who required the longest stay in the hospital to attain normal dark adaptation, as well as these three who did not become normal, were those who did not like foods rich in vitamin A or carotene. If these three

children are considered to represent exceptions to the rule that the dark adaptation test is a test of vitamin A deficiency, the test is still more than 95 per cent efficient when applied in a large scale survey.

The halibut liver oil and carotene in oil were administered in dosages computed to be approximately equivalent to the vitamin A content of 3 teaspoonfuls of cod-liver oil daily. Of the children whose dark adaptation was subnormal, the great majority attained normal adaptation within a period of a month after starting ingestion of vitamin A. At the dosage levels used, no difference was detected between the effectiveness of vitamin A and of carotene.

The second phase of this study gave evidence in addition to that in our former report that the test described is useful in detecting vitamin A deficiency. Also the conclusion seems permissible that the test may be used in large scale surveys with small chance of error, even if expert medical consultation is not employed. It is indicated also that vitamin A deficiency is much more prevalent than usually has been assumed.

Two other studies of the prevalence of vitamin A deficiency among school children have been found in the literature. Widmark and Svensson examined approximately 1,200 children from all economic and social strata of the manufacturing and seaport city of Malmo, Sweden, with a population of 120,000. They used the photometer test of Edmund, which consists of a single test of vision immediately on entering a dark room and without a period of adaptation. Only nine children were thought to have vitamin A deficiency. Frandsen found slight hemeralopia in forty-six of sixty-five apparently healthy school children of Copenhagen; latent hemeralopia was present in seventy of seventy-two children examined as private patients for eye complaints. Improvement or cure was produced by the administration of cod-liver oil for several weeks or months. The degree of night blindness was determined by the ability to distinguish letters of varying shades from black to faintest gray on a white background, in a light of constant dimness, after an adaptation period of from five to ten minutes.

SUMMARY

Using a test for ability to adapt to the dark as the means for detecting vitamin A adequacy, we found that 26 per cent of a rural group and 53 per cent of a village group of Iowa children presented evidence of vitamin A deficiency; in an urban group the proportion for the higher economic level was 56 per cent, for a middle level 63 per cent and for a low economic level 79 per cent. Of the seventy-eight village and rural children who were deficient in vitamin A and who continued under observation, all except three developed normal dark adaptation after a period of vitamin A or carotene ingestion.

Acute Otitis Media: Its Treatment with Results

By A. CAMPBELL, M.B., F.R.C.S.E.D.

(From the *British Medical Journal*, Vol. I, 18th April, 1936, p. 788)

DURING the course of a common cold, an influenza, or other febrile disease a patient develops an acute inflammation of the middle ear. So long as the otitis remains catarrhal—that is to say, an inflammation without the formation of pus within the middle ear—the treatment is more or less the same: drops to relieve the pain, rest in bed, calomel, heat applied to the ear as radiant heat or in the form of fomentations. Drops to relieve pain may be misleading, as with the cessation of pain we may consider the patient is improving, whereas the contrary is often the case. However, there is no doubt that a considerable proportion of patients respond to the treatment and recover without any further complication. On the other hand, in a large proportion catarrhal otitis becomes suppurative. There is increasing pain,

deafness, tinnitus, vertigo, a rise of temperature—particularly in children—and perhaps even tenderness over the mastoid process. It is now time to consider the advisability of a paracentesis. The drum is usually red and bulging. The bulging alone is a sufficient indication for a paracentesis in the absence of any of the symptoms which have already been mentioned, but usually it is associated with one or more signs or symptoms, such as pain, deafness, and frequently tenderness over the mastoid.

TECHNIQUE OF PARACENTESIS

Paracentesis is invariably done in a nursing home under a general anaesthetic such as ethyl chloride. After the skin of the ear and auditory canal is cleaned and painted with iodine the anaesthetic is commenced and an incision is made from below upwards in the posterior half of the drum, care being taken to avoid touching the inner wall of the tympanic cavity with the point of the knife. Pus or serum, sometimes accompanied by gas, escapes. A wick of gauze is introduced as far as the drum, and should be left in till the following morning, when it may be removed.

The discharge may be copious at once, or it may take thirty-six to forty-eight hours before it is free. The discharges are mopped up with sterile wool for forty-eight hours, and then, if copious, the ear is irrigated four-hourly, six-hourly, or thrice daily, according to the quantity of the discharge. The more copious it is the more frequently is the ear irrigated and dried. Irrigation, which may be carried out with a Higginson syringe fitted with a glass nozzle, should be gentle. It is comforting to the patient, and is tolerated by even the most nervous children. Force should not be used in irrigating.

The essential points in after-treatment are therefore frequent syringing followed by thorough drying of the auditory canal, so that neither debris nor pus may impede the free drainage from the middle ear. Radiant heat is applied to the ear thrice daily for about twenty minutes at a time. The mastoid area may be fomented if there is pain or tenderness in this region. Such symptoms persisting for a day or two after paracentesis do not mean that there is a mastoiditis which will necessitate operation. In the great majority of cases the patient recovers without further surgical treatment. Rest in bed for at least a week is essential after a paracentesis, by which time the temperature in children has usually become normal. Adults have little or no fever with an uncomplicated acute otitis media.

COMPLICATIONS AND AFTER-CARE

The most serious complication in the early stages of an acute otitis is meningitis, but fortunately this is rare. It is important to watch the temperature and to look for early signs of meningitis if it remains elevated. No rule can be set down in this matter, as cases vary so much in different seasons and years.

In the uncomplicated case the discharge becomes gradually less in about a week or ten days, and usually ceases in about sixteen days. After the discharge ceases, which coincides with the closure of the perforation or incision in the drum, the hearing is still impaired.

Politization daily or thrice weekly will restore the hearing to normal in a fortnight, or in all about thirty days from the commencement of the otitis. This is the course in the average cases. The patient remains in the nursing home for about ten days, and then is treated daily in the consulting room till the discharge ceases, and thereafter twice or thrice weekly till the hearing is restored to normal. In short, the treatment may be summarized as follows: paracentesis, syringe, dry, politzerize, dry, powder.

VALUE OF SYRINGING

The treatment which has been described is one I have used for the last fourteen years without variation. A form of treatment frequently described as the 'dry treatment'—that is to say, never irrigating, but relying on mopping the canal followed by the instillation of drops—has not been used in this series. If an ear is

not syringed it soon collects debris and pus sufficient to interfere with free drainage.

It is idle to say syringing may cause secondary infection of the middle-ear cavity. Assuming the paracentesis and the after-treatment is done aseptically, then we can at worst only drive the same bacteria into the middle ear as came out of it. But we must not overlook the fact that the mucous membrane of the middle ear is acutely inflamed, and little or no cavity exists because of the oedema; the possibility of driving bacteria back into this almost non-existent cavity is therefore extremely remote.

The use of drops, such as alcohol, magnesium sulphate, glycerin, hydrogen peroxide, picric acid, etc., seems to me to be useless. They cannot penetrate the middle-ear cavity, as the cedematous mucous membrane will not permit this. Moreover, if strong antiseptics such as alcohol, picric acid, etc., did penetrate the middle-ear cleft they would paralyse the ciliated mucous membrane for some hours, and the useful purpose it serves of propelling the discharge onward would be suspended, at least temporarily.

Drops are useful in certain stages; if a conical perforation develops it is often benefited by boric acid and alcohol drops, but then there is no danger of the drops reaching the tympanic cavity. It is often said that syringing drives the bacteria into the mastoid process, but the mastoid cells are in an active state of inflammation in every case of acute otitis media. This is well demonstrated in the early stages by x-rays, in which the cells show up as cloudy compared with the normal mastoid. Traumatic perforations, however, should not be syringed unless they reach the stage of profuse discharge; then they may be treated as a paracentesis case.

THE DRY METHOD

The method of mopping up the discharge has been described as the dry method, but I believe the method which I have described is the true dry method. The only wet part of the treatment is the irrigation; then the canal is dried thoroughly. After the patient leaves the nursing home the ear is syringed daily, dried, politzerized so as to drive away any secretions out of the tympanic cavity, dried again, and finally powdered with boric acid.

A study of the literature on the subject of the treatment of acute otitis has not presented anything very definite; some syringe, and others do not; no hard-and-fast rules have been laid down by either side.

FIRST SERIES OF CASES

Cases which were paracentesized before spontaneous rupture of the drum took place numbered 339; of these, twenty-four cases, or 7.06 per cent, required a simple mastoid operation. One of the paracentesis patients died as a result of pneumococcal meningitis without macroscopic evidence of involvement of the mastoid cells; it seemed to be a fulminating type.

The healing of the perforation took on an average sixteen and a half days, and the return to normal hearing averaged thirty days from the date of paracentesis. The hearing result was noted in only 161 cases, as many small children could not be tested, and others with previous hearing defects could only be estimated. Of the 161 patients all were satisfied that no defect in hearing was left after healing was complete. Age and sex were noted in all cases, but they have no bearing on the subject, except to demonstrate that the majority were children.

SECOND SERIES OF CASES

Cases which were paracentesized after the discharge had commenced, owing to pain, elevation of temperature, mastoid tenderness, etc., numbered 126. It is surprising how frequently on incising the drum in such cases pus escapes under pressure. Of this series twenty-two, or 17.4 per cent, required a simple mastoid operation. There were a few cases where the operation was performed two or three days after paracentesis, and I think these should be left out of this calculation, as

they probably had a mastoiditis when the paracentesis was done. The more correct percentage, therefore, would be between 14 and 15. There was one death in this series, due to meningitis caused by a hemolytic streptococcus, without macroscopic involvement of the mastoid.

A comparison of the first and second series demonstrates that early paracentesis, before spontaneous rupture takes place, is the best form of treatment. Quite apart from an early paracentesis there are other factors which influence the disease, the chief of these being, I believe, the virulence of the infection and the resistance of the patient. In certain years the disease is mild, in others it is exceptionally virulent, and liable to give rise to complications.

The most frequent causes of otitis media in these cases were the common cold and influenza, followed in order by tonsils and adenoids, scarlet fever, and measles. Nine cases followed operation on the nose, of which four required mastoid operations.

CASES REQUIRING OPERATION

One hundred and six patients were operated on by the Schwartze method, which is commonly known as the simple mastoid operation, with preservation of the drum and return of hearing in the vast majority of cases to normal. As a routine method the mastoid antrum, the lateral sinus wall, and the dura of the middle fossa were exposed, while the mastoid tip was explored and removed in most cases. Except in a few isolated instances the routine has been adhered to, so that the possibility of overlooked infected cells, a perisinusitis, or extradural abscess was minimized.

Twenty-two, or 20 per cent, of these patients had been paracentesized before spontaneous rupture; the balance of 80 per cent were either not paracentesized at all or only after spontaneous rupture had occurred. These figures show the importance of early paracentesis; 93 per cent of cases of acute otitis media are cured by paracentesis before rupture, with return of hearing to normal within a month.

After the Schwartze operation is completed an attempt is made to syringe saline through the aditus so that it comes out of the perforation and into the external auditory canal. Care must be taken not to force the liquid through in any manner. The cavity is then filled up with absolute alcohol, dried, iodoform gauze packing introduced, and the incision is partly closed. The external canal is plugged with narrow iodoform gauze, so that no narrowing of the canal is allowed to take place. The wound is left undisturbed for four days, when the packing is removed, which is always a painful process. Fresh gauze is reintroduced daily till the cavity heals by granulation. The perforation usually heals in a few days, and from then on the cavity is allowed to heal up rapidly. A plastic operation to bring the skin edges together is sometimes necessary. Eventually politizerization will restore hearing to normal. There should be no mortality in uncomplicated cases of acute mastoiditis.

RESULTS OF OPERATION

In the 106 patients operated on the ages varied from 6 months to 60 years; 48 per cent were under the age of 12. The hearing result was noted in sixty-seven cases, of which fifty-eight were normal, four were noted as good, and five as moderate. It must be remembered in this connection that patients with indifferent hearing before operation were satisfied that they heard as well after operation.

The perforation healed completely in 102 out of 106 cases. A permanent perforation remained in three cases, and there was no note in one. The dura of the middle fossa was exposed in all but two cases, both under the age of 1 year. The lateral sinus was exposed in all but one case, again under 1 year of age. A perisinus or extradural abscess was present in nine cases.

Temporary facial paralysis developed in three cases, lasting six to nine months before recovery. In all these cases the cells dipped medial to the facial canal.

There were five cases of Bezold's mastoiditis, but they did not require any further intervention beyond removal of the mastoid tip. Only one case of Gradenigo's symptom-complex was observed.

The time of healing varied from eleven to 150 days, the average being thirty-five days; plastic closure was necessary in twenty-six out of 106 cases, chiefly to prevent unsightly post-auricular depression.

The mastoid process was cellular in eighty-three cases, diploic in fourteen, sclerotic in one case (a diabetic), and there is no note in eight cases.

Blood-clot healing was the method employed in thirteen cases early in the series. The mastoid cavity, after being thoroughly cleaned by syringing and alcohol, was allowed to fill up with blood and the wound closed. Nine of these recovered without breaking down of the wound. The balance recovered after breaking down or reopening of the wound. I do not recommend this method. Within the last eighteen months fifteen cases have been drained through the post-auricular wound by means of one or more rubber tubes. The wound is closed above and below the tubes. After four days the tubes are removed painlessly and gauze packing substituted daily. By this method there is no pain during the dressings, and the results are as good as the packing method, and I believe a little quicker in healing.

Two of the 106 cases subsequently required a radical mastoid operation.

MORTALITY

There were two deaths in this final series of 106 cases. Both occurred in cases of long-standing mastoiditis, which should have been operated on very much earlier. Both had diploic mastoids; one died of pneumonia, and the other of cellulitis of the neck, followed by meningitis. This is not to say that I have not had other deaths following mastoid operation, but these have all been in cases where intracranial complications were present before operation, and such cases are not included in this series.

CONCLUSION

The main purpose of this article has been to give the results of one method of treatment of acute suppurative otitis media and its most frequent complication—acute mastoiditis. Early paracentesis is strongly indicated to prevent so far as possible the onset of mastoiditis and ensure a quick convalescence. Only 7 per cent of patients who have had an early paracentesis require a mastoid operation. Except under exceptional circumstances an acute mastoiditis does not develop for seven to twelve days after the onset of an otitis.

No attempt has been made to tabulate indications for operation, as no hard-and-fast rules can be laid down. Some patients have mastoiditis without any discharge, others with; some with swelling, others without; while tenderness and a high temperature may exist or not.

Experience counts as much here as in any other field of surgical work, and even then a furuncle may be mistaken for a mastoiditis.

A Clinical Study of the Effects of Treating Malaria with Atebrin and Atebrin Musonate

By S. F. SEELIG

and

W. SINGH

(From the *Records of the Malaria Survey of India*, Vol. VI, No. 2, June 1936, p. 171)

THIS investigation was undertaken in order to ascertain how quickly treatment of malaria patients with atebrin and atebrin musonate would restore their fitness for military duty, as judged by the clinical and parasitological effects obtained.

For this purpose, 25 patients suffering from various types of malaria were selected. These were all soldiers in the State Forces of His Highness the Maharaja of Patiala, and were treated in the Military Hospital, Patiala. The study of the clinical and parasitological observations followed closely the suggestions made

the Health Organization of the League of Nations. The suggested data were collected and recorded on the charts issued by the latter organization.

The total cases observed were 25 in number. They were all well fed and in excellent general condition. None could be described as being either seriously ill or suffering from any complications. None of them was a case of fresh infection, as they had all suffered from previous attacks of malaria.

TYPE OF INFECTION

Series.	<i>Plasmodium vivax</i>	<i>Plasmodium falciparum</i>	<i>Plasmodium malariae</i>
I	3	4	1.
II	4	3	..
III	4	5	..
	..	1	..
	11	13	1

[The meaning of this table as it appears in the *Records* is difficult to follow. We have given our own interpretation. However, in the charts—which we have not reproduced—every case is given as a 'B. T.' infection; this appears to be contradicted in the text.—EDITOR, I. M. G.]

For the purpose of treatment the patients were divided in three series as follows:—

Series I.—Eight cases received a subcutaneous injection of 0.75 mg. adrenaline (1 : 1,000) followed half an hour later by an intramuscular injection of 0.375 gm. atebirin musonate. Twenty-four hours later a regular peroral course was commenced with atebirin tablets, 0.1 gm. thrice daily for five subsequent days.

All cases of this group were admitted with fever, which did not appear again after the treatment was started. None of these patients showed any unusual feature which should point to a complication. Case 7 showed signs of cerebral excitation on the day of administration of atebirin musonate. However, these signs were already noticed before the injection was given. He had also vomited before treatment was commenced.

Case 4 had a slight rise of temperature due to coryza. In none of the cases was reappearance of parasites recorded.

Series II.—The treatment in the seven cases of this series was carried out as follows:—

A dose of 0.75 mg. adrenaline (1 : 1,000) was injected subcutaneously, and half an hour later, this was followed by an intramuscular injection of 0.375 gm. of atebirin musonate.

All cases of this group had fever on admission and, as indicated on the charts, fever reappeared in three out of seven cases of this series. No complications or toxic symptoms were observed. Case 13 had vomited before and on the day on which treatment was commenced.

Regarding the reappearance of parasites in the blood, the same species of plasmodium as found before the commencement of treatment was detected again in case 12. The latter case also developed on the fourteenth day after commencement of the treatment a rise of temperature to a degree which necessitated a second adrenaline and atebirin musonate injection, after which no rise of temperature occurred during the following three days of observation.

Case 9 had a rise of temperature on the sixth day after the commencement of treatment. Although the blood was not examined for plasmodia on that day, a relapse may safely be assumed; adrenaline and atebirin musonate were given and the temperature became

normal. On the tenth day after commencement of treatment gametocytes were found, and at once a course of plasmoquine simplex was started in doses of 0.02 gm., thrice daily, for five subsequent days. The question whether the rise of temperature on the sixth day was due to a relapse of the primary type of infection, or to gametocytes, must be left open because no parasitological record is available.

Case 10 had a rise of temperature on the fifth day after commencement of treatment. Although no parasitological record is available, a relapse was assumed and adrenaline and atebirin musonate were given. No fever and no reappearance of parasites occurred afterwards.

Case 16 showed gametocytes on the seventh day after commencement of treatment, and a regular course of plasmoquine, 0.02 gm., was given thrice daily.

In case 13 also gametocytes were found on the seventh day after treatment was commenced, and he also was given a course of plasmoquine.

The other two cases of this group presented no feature of particular interest.

Series III.—This group of nine cases was treated with two intramuscular injections of atebirin musonate, the injections being separated by an interval of 24 hours.

All the patients had fever on admission. Excepting case 24, who had a moderate rise of temperature on the second day after the first injection, i.e., on the day following the second dose, none of them developed subsequently a temperature above normal.

Case 18 vomited on the day previous to, and on the day, when the first injection was given.

In case 17 the original species of parasites, both rings and gametocytes, were found again on the seventh day after commencement of treatment, i.e., fifth day after the second injection, although a course of plasmoquine (0.02 gm., thrice daily, for five subsequent days) was started two days after the second atebirin-musonate dose. No clinical or parasitological relapses were noticed during the following period of observation of this patient.

Neither clinical nor parasitological relapses and complications were observed in any of the other cases.

One case, case 11, was given by mistake only one intramuscular injection of 0.375 gm. of atebirin musonate. On the seventh day after this injection gametocytes were found, but after a course with plasmoquine they were not seen again. This patient complained of vertigo for three days. 6th to 9th September, 1935, i.e., tenth to the thirteenth day after injection.

CONCLUSIONS

Twenty-five soldiers suffering from malaria, but otherwise in good general condition, were treated with different atebirin compounds. Two groups were also given injections of adrenaline in an attempt to force the parasites out of the internal organs into the general circulation, where the anti-plasmodial drug would have a better chance of acting upon them more quickly and completely.

The atebirin-musonate injection was given 30 minutes after the administration of adrenaline. This time was chosen because investigations of various authors and the experiments of one of us (S. F. S.) had previously shown that the culminating physiological general effect of adrenaline on blood pressure, pulse rate, blood sugar, circulating volume, etc., is found in normal individuals 25 to 45 minutes after the subcutaneous injection of 0.75-1 mg.

In a comparison of the effects of the three different methods of treatment under discussion, we shall have to consider the effect on

- (a) the clinical condition, i.e., occurrence of clinical relapse,
- (b) parasitological findings, i.e., the occurrence of parasitological relapse, and
- (c) by-effects.

By comparing these different factors, it may be possible to give a fairly appropriate answer to the question of which particular method of treatment will give the best result for restoring fitness for military duty.

Beginning with the last point, the by-effects played so small a part in our cases that they may be neglected in drawing any conclusions from this investigation.

Series I (eight cases).

(a) Effect on clinical condition and on relapse.

It appears that the method of treatment employed in this group furnished the most favourable results (adrenaline 0.75 mg. subcutaneously; atabrin musonate 0.375 gm. intramuscularly; atabrin tablets 0.1 gm. thrice daily for five days starting 24 hours after the injection of atabrin musonate).

Fever disappeared in all cases within 24 hours after the injection and did not reappear during the period of observation.

(b) As regards the parasitological findings the same favourable result was recorded.

None of the cases showed reappearance of plasmodia during the period from the commencement of treatment till the day of discharge from hospital.

Series II (seven cases).

(a) Effect on clinical condition.

The results obtained with this method (adrenaline 0.75 mg. subcutaneously and atabrin musonate 0.375 gm. intramuscularly) do not appear to be satisfactory. Three out of seven cases showed a considerable rise of temperature on various days after the injections were started.

(b) The reappearance of parasites in the blood suggests the same conclusion.

In two cases parasites were found after the injection, and only two cases out of seven showed a satisfactory result after treatment.

Series III (nine cases).

(a) Effect on clinical condition.

The method employed here (two intramuscular injections of atabrin musonate 0.375 gm. separated by an interval of 24 hours between the injection) gave more satisfactory results than the one described under Series II. One case only showed fever after treatment.

(b) The same favourable result was obtained in respect of reappearance of parasites in the blood. In one case only were plasmodia found after treatment.

SUMMARY

Comparison of clinical and parasitological data permits one to conclude that the method of administering adrenaline and atabrin musonate, followed by a course with atabrin tablets, by the mouth, furnished the best results in the cases under review.

The effect on fever and parasites in blood was equally good. The patients felt quite well on the day after the injection, and, if they had not been needed for our observations, appeared fit to be discharged from hospital on that day. However, we do not wish to recommend such an early discharge, because clinical experience has proved that the 'defence forces' of the body certainly act better under conditions of complete rest in bed than under conditions of muscular and general activity. The latter necessitates a higher metabolic activity mainly supplied by the glycogen depôts of the liver. The method appears convenient for the patients because of necessitating one injection only. They could safely be discharged on the day on which the oral treatment is concluded. For practical purposes it may be possible to discharge the patient on the second or third day of atabrin treatment by mouth, recommend him for light duty, and declare him fit after three to four subsequent days in accordance with the results of blood examination.

That the physiological effects of adrenaline enhance the therapeutic action of atabrin musonate is possible, but the evidence is not conclusive.

In respect of the practical success, it can safely be stated that method I gave the best results. No clinical or parasitological relapses were detected after the commencement of treatment.

Method III gave the next best results. Only one clinical and one parasitological relapse was observed.

Method II furnished unsatisfactory results. Both clinical and parasitological relapses were more frequent than in Series III. It appears that the dosage of 0.375 gm. atabrin musonate, although combined with adrenaline, is not sufficient.

It may be stated, therefore, that method I appears to be the safest, most reliable and convenient treatment for restoring the fitness of our patients for military duty by the administration of atabrin and atabrin musonate.

Reviews

BIRCH'S MANAGEMENT AND MEDICAL TREATMENT OF CHILDREN IN INDIA AND THE TROPICS.—By E. H. Vere Hodge, B.A., M.D., M.R.C.P., Lieut.-Colonel, I.M.S. Eighth Edition. 1936. Published by Messrs. Thacker, Spink and Company (1933), Limited, Calcutta. Pp. xi plus 377. Illustrated. Price, Rs. 7-8

It is no easy matter to present to those having the care of children in India information regarding management and medical treatment which will be of real value and assistance. The many editions of this well-known book are an indication of its success and of the widespread need which exists for a book of this type. The book was primarily intended for those without medical knowledge, out of reach of professional aid, not to replace the doctor, but to guide when he was not available, and to indicate when his presence was required. With the growth of knowledge of pædiatrics and to bring the book up to date much has now been added which is more suited to the needs of the practitioner, nurse, or medical student (in this edition certain parts are marked 'for practitioners').

The first eight chapters are devoted to the management of children in the tropics and the prevention of disease. The advice is essentially practical and in keeping with modern teaching, if somewhat conservative.

There is a chapter on the examination of sick children, and this is followed by descriptions of various disorders and diseases. There is a table on poisons and their treatment, a section on the administration of remedies, diets for invalids and children, a list of children's prescriptions and a table on the vitamin content of various foodstuffs.

The later editions of this book have been linked with the name of Col. Green-Armytage, and the latest edition has been brought out by his collaborator in the seventh edition, Col. Vere Hodge. The book has been almost entirely rewritten by the present author, but certain parts have been revised by other experts in special subjects, and the book contains the accumulated wisdom of many whose names are associated with the Calcutta Medical College and School of Tropical Medicine. As a handbook for nurses and practitioners in the tropics it may be recommended with the greatest confidence, but one would question whether the time has not come when the information should be presented in two volumes, one for those without medical knowledge, and the other a handbook of pædiatrics in the tropics. In the meanwhile, however, this new edition serves the double purpose better than any other book we know.

AN INDEX OF DIFFERENTIAL DIAGNOSIS OF MAIN SYMPTOMS.—By Various Writers. Edited by Herbert French, C.V.O., C.B.E., M.A., M.D. (Oxon.), F.R.C.P. (Lond.). Fifth Edition. 1936. John Wright and Sons Limited, Bristol. Pp. xii plus 1145, with 742 illustrations of which 196 are coloured. Price, 63s. Obtainable from Messrs. Butterworth and Company (India), Limited, Calcutta. Price, Rs. 47-4

THE reviewer, who has used the *Index of Treatment* and *Index of Symptomatology* in most of their editions during the last quarter of a century, was unfamiliar with this particular member of the series until he received the volume under review. He has found his introduction to this book a very pleasant experience. An index of differential diagnosis must be an extremely difficult book to plan and to edit. You cannot just turn to the specialist and ask him to write on his own subject; the contributors must be men who have had a wide general experience; for this reason we think that the editor of this particular book has earned his readers' thanks, not only by marshalling such an excellent team of contributors but by writing more than a third of the book himself.

The arrangement of the book is very much what the title indicates. Each important sign or symptom from 'Accentuation of the heart sounds' to 'Weals' (wrongly spelt 'wheels') is taken up one by one, its significance is considered, and the various disease syndromes in which it occurs are enumerated and discussed. In the examples mentioned, this is comparatively easy but when he comes to 'Pyrexia, prolonged' the skill of the writer is taxed to the utmost, as it is so very difficult to be comprehensive and yet concise. To particularize, this last-named section has been allotted 25 pages and the subject dealt with in a very complete manner; the tropical worker will find that his point of view has not been neglected. Malaria is of course mentioned here, and cross-references are given, but it is described at considerable length and some very good coloured plates are given under 'Anæmia'; to most readers in this country the name *Laverania malariae* for *Plasmodium falciparum* will be unfamiliar. In another place he introduces the species *Plasmodium falciparum quotidianum* as distinct from the above species. For the diagnosis of kala-azar, spleen puncture is, rightly, the only method mentioned. After 'Leishman-Donovan bodies' the words 'immature trypanosomes' appear in brackets; this is unfortunate, because, although the reviewer understood by this that the writer meant to imply that they were not unlike immature trypanosomes, not an inapt description, the preparer of the index took a different view and has inserted a reference to 'Kala-azar, trypanosomes in' which will tend to make the protozoologist raise his eyebrows. These quibbles about nomenclature are however small points and do not detract one iota from the practical value of this section to the practitioner.

Each section is dealt with in the same scholarly manner. The word 'index' does seem to suggest some sort of short cut to knowledge which would be frowned upon in medical schools, but there is nothing of the kind here. Each section would form the nucleus of a very good clinical lecture to students. It is in fact a textbook of medicine in which the subject is approached from a slightly different angle; it is, however, the angle from which the practitioner faced with making a diagnosis has to approach his patient.

An important feature of the book is the numerous useful illustrations that are in nearly every instance relevant, an exception being two beautiful illustrations of tse-tse flies which have possibly strayed from another volume. Many of these are in colour, depicting rashes, tongues, facies, etc., all of which are hard to describe by the written word. Other coloured plates show blood cells in various diseases (we cannot quite approve of the fully-hæmoglobinized megaloblast shown), and yet others simple biochemical tests in which colour change is the criterion. At the end of

the book there is a very comprehensive index of over two hundred pages, with four columns to the page.

Altogether it is a book that we can very strongly recommend to the practitioner and the teacher in this country; the price may be a little beyond the pocket of the average student, but to the student who can afford a luxury we also recommend this book.

L. E. N.

CHRONIC RHEUMATISM: CAUSATION AND TREATMENT.—By R. Fortescue Fox, M.D., F.R.C.P., F.R.Met.S., and J. Van Breemen, M.D. 1934. J. and A. Churchill, Limited, London. Pp. vii plus 364, with 8 plates and 38 text-figures. Price, 12s. 6d.

'THIS work is intended to be a plea for the better study of chronic rheumatic disease in its clinical and physiological aspects and for its systematic functional treatment'.

The author disclaims any attempt to deal with the problem of rheumatic disease in its entirety but has put forward certain important aspects and particularly called for more elaborate and careful diagnoses as an introduction to treatment.

It is unfortunate that a more definite statement is not given at the outset as to what is meant by chronic rheumatic disease as the reader is left in some degree of mystification till a later stage in the book.

The abrupt introduction of Aschoff's nodules in the heart or the scars thereof as typical of the disease leads up to the suggestion that there is a definite connection between rheumatic fevers or its variants and other states of arthritis, a conception to which it is difficult to subscribe when one considers the remarkable clinical differences between rheumatic fever and acute rheumatoid arthritis in patients of the same age.

In the introduction the decisive factors of rheumatism are given as: (1) A primary focus of infection; (2) the constitution of the patient; (3) disturbances in the circulation of the skin, and (4) external factors. Chapter I, under the arresting title 'The skin as an organ', explains the variability of blood in the skin according to external stimuli and its power of independent automatic control. Full consideration is given to the physiology of the skin, its response to stimuli and its function as a regulator of heat and as an organ of immunization, the thesis being that disorders of the skin circulation are associated with and largely responsible for rheumatic states, ætiological factors, focal sepsis.

The author next passes on to a fuller discussion of the ætiological factors, constitutional abnormalities with their characteristics, especially enlarging on them and the abnormalities of the circulatory disturbances of the skin and the abnormalities of the capillary loops, illustrated by photomicrographs, and finally external causes, climate, weather and occupation. The various accepted forms of classification are given and the author points out that there are no less than 21 different names for rheumatoid arthritis.

The next section deals with the early stages and recognition of rheumatism together with the necessity for detailed examination, including the significance of the sedimentation test and the estimation of uric acid in the blood.

Some illuminating points regarding x-ray readings are given and the reader is warned against pitfalls in diagnosis; then follows a discussion of the different clinical types of arthritis and rheumatic manifestations. The whole of this interesting preamble is leading up to:—

1. The importance of regarding rheumatism as a generalized disease.
2. The importance of accurate diagnosis not only between the different types of rheumatism, but also between the different stages.
3. The justification of physiotherapy particularly with a view to correcting the abnormalities in the skin circulation.

The section on treatment opens with a useful scheme for approaching the problem of the individual patient. The principles of the application of heat, of hydrotherapy, the value of therapeutic pools and the detailed indications enabling the practitioner to select the appropriate physiotherapeutic measures receive full attention. It is pointed out that it is not desirable to administer vaccine therapy and physiotherapy simultaneously. The remainder of the book is devoted to the description of various public activities including those of the Ligue Internationale Contre la Rheumatisme and the treatment of rheumatism as a public health problem.

To sum up, the book is instructive and calculated to promote insight into the problems of rheumatic infection and further to stimulate scientific interest in the investigation and treatment of a group of diseases which admittedly receive insufficient attention and understanding from the practitioner.

E. H. V. H.

DISEASES OF THE HEART.—By John Cowan, B.A., M.D., D.Sc., F.R.F.P.S., and W. T. Ritchie, O.B.E., M.D., F.R.C.P.E., F.R.S.E. With a chapter on 'The Ocular Manifestations of Arterial Disease'. By A. J. Ballantyne, M.D., F.R.F.P.S. Third Edition. 1935. Edward Arnold and Company, London. Pp. xvi plus 631. Illustrated. Price, 30s.

THIS book needs no introduction and a warm welcome is assured to the new edition. The first edition appeared in 1914 and in the preface it was stated that:—'The importance of cardiac muscle in the maintenance of the circulation renders necessary a short account of the diseases by which it is affected'. At that date this statement reflected the trend of modern cardiology. The demand is now for a fuller investigation and knowledge of the pathological states of the myocardium upon which heart failure in varying degrees, in the vast majority of cases, depends. This demand is fully met, much new material has been added and the authors have presented us with an admirable summary of modern cardiology for which the profession will be duly grateful.

The first two chapters have been devoted to the consideration of the anatomy and physiology of the heart, its blood supply and innervation; matter essential to the proper appreciation of the subsequent chapters. Next follows a short description of some of the major phenomena of circulatory failure. We could have wished that more space had been allotted to failure in acute toxic states and that some reference had been made to damage or to hæmorrhage into the adrenals as a contributory factor to sudden peripheral failure.

The disorders of rate, rhythm and conduction are introduced by chapters on the pathology of the heart muscle, the use and interpretation of polygraph and electrocardiographic tracings. The difficult subject of cardiac neuroses is discussed and the reader reminded of a fact, too often forgotten, that acute febrile disease always produces pathological changes in the heart muscle, though such changes are usually transient.

In describing the signs of heart weakness, the authors emphasize the limitations of the electrocardiograph in revealing diffuse or localized lesions and categorically state that a normal electrocardiogram does not necessarily mean a normal heart muscle. This is a matter which the profession as a whole does not appear to have grasped.

Not the least valuable part of the book are the illustrations, not only commendable for their intrinsic merit, but each one having a definite purpose and serving to amplify or explain the text. A section on the diseases of the arteries, an integral part of the subject and one which cannot be dissociated from diseases of the heart, completes the volume.

To sum up, the third edition of this well-known book will add to the reputation established by the previous

editions and should be the constant study of all practitioners and advanced students.

E. H. V. H.

THE PRACTITIONERS' LIBRARY OF MEDICINE AND SURGERY. Volume IX. (Neurology and Psychiatry.) 1936. D. Appleton-Century Company Incorporated, New York and London. Pp. xlviii plus 1234. Illustrated. To be completed in 12 volumes, and general index. Sold in complete sets only: Rs. 485. Only available from Messrs. Butterworth and Company (India) Limited, Calcutta

To justify its inclusion in this series, the volume under review had to be written in language that the practitioner can understand. This is no easy matter as psychiatry has above all other specialties developed a language of its own. On the whole, it can be said that the editor has succeeded remarkably well.

Further, psychiatry must still be classed as a medical art which is trying hard, with only limited success up to the present, to become a medical science. The following paragraph, quoted from this book, shows the difficulties of writing on this subject:—'The main offices of the author will be eclectic, that is to select from the whole mass of principles, theories and facts those which seem relevant to the problems of the general practitioner as he deals with the human being in all his relationships and especially in sickness, and to weld the selected material into a coherent and non-contradictory approach. This selection and welding will be, to a certain extent, arbitrary and express a personal point of view. This cannot be helped in a field in which objective scientific method is more a consummation to be devoutly wished for than at present realized'.

In a section headed 'social hypochondriasis' it is suggested that many acquired neuroses are engendered in the child by its mother and in the adult by his physician through injudicious insistence in an unwelcome diet, and the writer suggests that the state of anxiety provided by insistence on a rigid diet in the hypertensive subject is likely to do him more harm than any mild dietary indiscretion.

The subjects have been arranged on an ætiological basis as far as possible, and a hard-and-fast line has not been drawn between neuroses and psychoses; for example, the ætiology, pathology and clinical manifestations of neurosyphilis, from symptomless neurosyphilis to general paralysis of the insane, are discussed side by side. Incidentally, the unqualified statement that five per cent of syphilitics develop general paralysis is surely misleading; on the basis of ten per cent of the population having a syphilitic taint (a low figure), the general paralysis incidence should be five per thousand.

Considerable space is given to drug psychoses, and here opium receives most attention. The methods of treatment are well discussed but we did not notice any reference to the vesicatory blister or the lecithin methods. We agree with the statement in this chapter, that 'Mohammedans would not be classified as a peace-loving race'; we should not classify them as a race at all, any more than we should refer to the Christian race.

The book is a useful member of this important medical encyclopædia.

LOBAR PNEUMONIA AND SERUM THERAPY: WITH SPECIAL REFERENCE TO THE MASSACHUSETTS PNEUMONIA STUDY.—By F. T. Lord, M.D., and R. Heffron, M.D. 1936. The Commonwealth Fund, New York, and Oxford University Press, Humphrey Milford, London and Bombay. Pp. 91. Illustrated. Price, 4s. 6d.

In this monograph the authors discuss the question of specific therapy of lobar pneumonia caused by the different types of pneumococcus.

Out of all the different types of pneumococcus specific therapy is known to be effective only against type I and type II infections. The authors, therefore, think

it desirable to determine the type before treating any case with serum. Otherwise a large number of patients would be subjected to needless expense and possibly of untoward reactions. This remark should apply even more strongly to the serum treatment of pneumonia patients in India as in this country the incidence of types I and II is not so high as in the West. The diagnosis of the type of infection is readily made by the examination of the sputum by the Neufeld method of typing. In this method a loopful of the sputum and two loopfuls of type-specific rabbit antiserum are mixed on a slide which is examined under the oil immersion. A positive reaction in a mixture of pneumococci and homologous antiserum is shown by a marked swelling of the capsules of pneumococci.

The authors do not advocate serum treatment in cases of children under twelve years of age. It is difficult to obtain sputum for typing from these patients and the veins are of small size so that it is difficult to make repeated intravenous injections.

Before treatment with specific serum is commenced two precautions should invariably be taken. Firstly, the patient should be asked whether he has had asthma or hay fever specially on exposure to emanations from horses. Secondly, he should be tested for sensitivity to horse serum by means of the eye or skin test.

D.

THE PRACTITIONERS' LIBRARY OF MEDICINE AND SURGERY. Volume X. (Dermatology and Syphilology.) 1936. D. Appleton-Century Company Incorporated, New York and London. Pp. lxxviii plus 1043. Illustrated. To be completed in 12 volumes, and general index. Sold in complete sets only: Rs. 485. Only available from Messrs. Butterworth and Company (India) Limited, Calcutta

THAT many skin lesions were manifestations of some systemic disturbance and that others were due to external causes acting locally has been appreciated by the medical profession from the time of Hippocrates. The new conception of dermatology to which the present-day dermatologists lay claim amounts to the fact that more skin diseases are being placed in the first category, that we are realizing that in many instances where the determining factor is a local one the predisposing factor is systemic, and lastly that we are acquiring a more accurate knowledge of what is the particular defects in the body economy with which the various skin diseases are associated. This newer conception, if it can be claimed as new, is kept well in view by the writers of the different sections of this volume.

The main sections of the book are: 'General considerations', a very useful review of dermatology of which the first few—too few—pages are devoted to anatomy and physiology of the skin; 'Infections', bacterial, fungal, protozoal, and helminthic; 'Dermatitis and eczema'; 'Tumours'; 'Dermatoses of toxic origin'; 'Generalized erythematous squamous and papular dermatoses', including psoriasis, the pityriasis, and exfoliative dermatitis; 'Congenital abnormalities'; 'Diseases of the skin appendages'; 'Diseases of the lips and mucous membranes'; 'Pigmentary disturbances'; 'Trophic and endocrine manifestations'; 'Cutaneous neuroses'; and 'Syphilis'.

While most of the sections in this book are good, there are many defects which mar it as an authoritative treatise on dermatology. Leprosy—a world-wide and very important disease—is given two and a half of the total of over a thousand pages; under the heading 'Geographical distribution', seven states and four cities, all in the United States of America, only are mentioned, and there is no reference whatsoever to the rest of the world. (Is the writer so ignorant that he does not know that leprosy exists outside the States, is he so 'American' that he thinks its existence elsewhere doesn't matter, or is he so modest that he thinks that no one outside the States

will read this book?) The section makes one doubt if the writer has ever had any experience of the disease, even in the United States; he has however invented a new principle in chaulmoogra oil, *gynocardiac acid*.

It is easy to forgive a failure to refer to post-kala-azar dermal leishmaniasis, as it is a particularly local (geographically) condition, but less easy to condone the omission of berberine sulphate in the treatment of oriental sore; both omissions however are surprising in view of the fact that amongst the list of references are two papers each of which deals with one of these subjects exclusively. In the section on oriental sore one sentence deserves full quotation 'Unlike kala-azar, the parasites occur in the erythrocytes only on rare occasions and then only during active stages of the disease'. As a masterpiece of ambiguity and error in grammar, punctuation, and protozoology, the sentence would be hard to beat.

Some of the defects in the section dealing with tropical skin affections can be attributed to the fact that 'Manson, P. Tropical Diseases, 6th edition' appears to have been the most recent edition available to the writer, the rest to a vivid imagination.

Though the volume falls below the high level of some of the others of this series, it contains much information on this very difficult subject of dermatology that will be exceedingly useful to the practitioner.

DIFFUSE SCLEROSIS (ENCEPHALITIS PERIAXIALIS DIFFUSA).—By Prof. L. Bouman, M.D. 1934. John Wright and Sons Limited, Bristol. Pp. iv plus 160, with 64 illustrations including tabulated notes of 100 cases. Price, 15s.

THIS monograph is the outcome of a patient investigation of a rare disease, sometimes known as Schilder's disease, which has attracted the attention of neurologists of late years. The author has described in the most minute detail his own cases from all points of view, clinical and pathological and further submits tabulated notes on 100 cases. He thus definitely establishes this condition as a clinical entity and provides the reader with data on which to base a diagnosis. A distinction is made between the clinical course in children up to 15 and in adolescents or adults. Copious illustrations including many illuminating the text. The addition of completes what must be regarded as an exhaustive treatise on the disease as far as present knowledge permits. The book is naturally not one which will attract the general practitioner, but will be received by the neurologist with interest and respect.

E. H. V. H.

ARTHRITIS AND RHEUMATOID CONDITIONS: THEIR NATURE AND TREATMENT.—By Ralph Pemberton, M.S., M.D., F.A.C.P. Second Edition. Thoroughly revised. (French translation of First Edition.) 1935. Baillière, Tindall and Cox, London. Pp. 455. Price, 27s.

THE second edition of this monograph should be ample testimony of its value. At the outset it might be said that it is a book rather for the general practitioner than the specialist and a perusal of its pages will explain our recommendation. The problem of arthritis is far from being solved; numerous theories as to its cause have been proposed and an equally varied therapy tried with a varying degree of success. One thing appears to stand out clearly, however, namely that it is not a specialist's disease. The patient should be examined from every angle and in many cases different forms of therapy tried out. Focal sepsis so popular some years ago explains many cases and is undoubtedly often the cause of the condition but there are many exceptions. A broad clinical sense and a catholic selection of the various forms of treatment are required of the physician who wishes to give some satisfaction to all those coming under his care for arthritis. The book discusses the pathology

of the disease according to the usual classification. There is a chapter on the biochemical changes taking place in arthritis but the data so far obtained do not help one very much. The various forms of treatment are carefully discussed, balneology, diet, protein therapy, etc., and should all be considered by the physician without bias.

Arthritis is a sad page in a medical textbook but this book should enable one to make the most of our available knowledge.

H. E. C. W.

THE CARE OF THE AGED, THE DYING AND THE DEAD.—By A. Worcester, M.D., Sc.D., and Charles C. Thomas, Springfield, Illinois, Baltimore, Maryland. Pp. vii plus 77. Price, 4s. 6d. (Available from Messrs. Baillière, Tindall and Cox, London)

THIS small book might be read with profit by all medical practitioners at the commencement of their careers, for it gives valuable advice as to how the true art of the physician may be exercised in one important section of his profession.

The book gives no technical or modern scientific advice, in which the latest methods and discoveries are described, but informs the inexperienced doctor how, by the employment of common sense and the cultivation of kindness and human understanding, he can ease the last years of the aged and the hours of the dying as well as help the relatives during a difficult period of their lives.

The section on care of the dead is a well-reasoned indictment of the modern tendency to excessive expenditure commonly indulged in and actually approved of by many bereaved families in their idea that such display and lavish expenditure (full advantage of which is taken by the undertaker) is obligatory upon them, to show proper respect to their dead relative.

This is an unusual medical book especially in these modern days when practically all publications deal only with the strictly scientific aspects of our art, to the almost total exclusion of the older but still important philosophical side of our profession which must be appreciated by the really successful general and family practitioner.

The only criticism we have to offer is that the price is somewhat high for a small paper-covered volume, notwithstanding the fact that it is artistically produced.

P. A. M.

POST-GRADUATE SURGERY.—Edited by R. Maingot, F.R.C.S. (Eng.). Volume II. (Head, Neck, Breast, Thorax, Genital Organs, Urinary System, Adrenals, Sympathetic Nervous System, Injection Therapy, Spinal Column, Hand Orthopaedics—Pre- and Post-Operative Treatment.) 1936. Medical Publications Limited, London. Pp. viii plus from 1747 to 3572 with 1,134 figures in the text. Price, 70s. per volume or £9-9-0 per set of three volumes. (To be completed in three volumes.) Sold in complete sets only. Price, Rs. 150. Payable Rs. 20 per month. Ten per cent discount to cash purchasers. Only available from Messrs. Butterworth and Company (India), Limited, Calcutta

We have received with pleasure the second volume of *Post-Graduate Surgery* edited by Rodney Maingot. Our expectation, that this volume would conform to the high standard of excellence set up by the preceding one, has been agreeably confirmed. The present volume, consisting of eleven parts and 1800 pages of printed matter, is another stupendous production. It begins with part VI, in which Wakeley gives an authoritative account of the surgery of the head, spinal column and salivary glands. Regarding the diagnosis of cerebral tumours, ventricular estimation is a much simpler and safer procedure than ventriculography. Other noteworthy chapters deal with the technique of brain operations and surgery of the spinal cord, incorporating all important recent advances on the subjects.

In part VII, Sir William De C. Wheeler deals with the surgery of the neck. Rectal oil-ether anaesthesia in combination with local infiltration is preferred for operations on the thyroid gland. Continuous gas and oxygen is recommended as an alternative to colonic oil ether. Crile's method is also described. It is a valuable and informative chapter but there is no mention of Sir Thomas Dunhill.

The chapters on the surgery of the breast are by McNeill Love. The writer advocates the drainage of a mammary abscess by the closed method. The prognosis in mammary carcinoma does not appear to show any marked improvement. Recent investigations indicate that the 'crude' survival rate five years after operation is about 36 per cent.

In part IX, the thorax is considered in two sections. Two valuable chapters are contributed by Sleigh Johnson, on post-operative chest complications and artificial pneumothorax which are described under a subtitle as medical conditions. To Holmes Sellors is assigned the surgery of the thorax. The chapters on intrathoracic tumours and bronchiectasis are eminently practical. A multiple stage lobectomy is preferred for the later condition, the method of 'plombierung', as employed by Sauerbruch, is given the first place.

Part X deals with surgery of the female genital organs. The first two sections consisting of regional gynaecology and gynaecological operations are written very fully by Lyle Cameron and are profusely illustrated. Esthiomene is a rare condition, but it is now regarded to be homologous with the climatic bubo in the male. It is better known as lymphogranuloma inguinale or poradenitis. One of the most reliable features in the diagnosis is the Frei test. Bonney, the worthy exponent of Wertheim's operation, reports a 10 per cent operative mortality. Sidney Forsdyke's contribution on sterility in women is both instructive and practical. In the last section Green-Armytage writes on ovarian tumours.

The surgery of the urinary and the male genital tracts are dealt with by Ainsworth Davies. For safe and efficient local anaesthesia of the male urethra, a mixture of equal parts of 0.5 per cent solution of cocaine hydrochloride and sodium bicarbonate is recommended. It is regrettable that Prof. von Lichtenberg's name has not been mentioned in connection with excretion urography. The surgery of the enlarged prostate is one of the finest chapters in this volume. There are excellent descriptions of Harris's operation and pre-urethral resection of McCarthy. Regarding the imperfect migration of the testis, Ombredonne's method of orchidopexy has been described. Thorek's operation might also have found a place. There is no mention of the endocrine treatment, for which remarkable results have recently been claimed.

In part XII, Lawrence Abel gives a very complete and practical summary of the surgery of the sympathetic nervous system. It consists of twelve chapters, including surgical anatomy, physiology, methods of investigation and treatment. This part is worthy of careful perusal by everyone. The adrenal gland is next considered; the surgical portion is written by Broster and the surgical pathology by Vines. Broster's conclusions are interesting. A differential stain has been found, which has given positive results in all his cases.

Injection therapy is considered in part XIV; De Lisle Gray writes on *herniae* and Simpson Harvey on *haemorrhoids* and *varicose veins*. Other interesting chapters are those on *hydrocele* and *varicocele* by Rodney Maingot, and *gravitational crural ulcers* by Dickson Wright. The next part consists of an excellent article by Hamilton Bailey in his characteristic lucid style on *infection of the hand*. The last part is devoted to *orthopaedics* and is written by Buxton. The chapter on *acute osteomyelitis* is particularly instructive.

It remains only to congratulate the editor and his colleagues for the successful completion of the present volume. We confess that the two published volumes have already become indispensable to us as a standard reference book of surgery and as a textbook for advanced students. It does not require any prophetic

vision to predict that the final volume is assured of a cordial welcome on publication. The intrinsic merit and the utility of the book have been greatly enhanced by the excellence and remarkable profusion of illustrations. The coloured frontispiece is a welcome addition. The printing and get-up are first rate.

P. N. R.

HANDBOOK OF UROLOGY.—By Vernon Pennel, M.A., M.B., B.Chir. (Cantab.), F.R.C.S. (Eng.). 1936. Cambridge University Press, London. Pp. viii plus 224. With 4 coloured plates and 34 figures. Price, 7s. 6d.

It has been the aim of the author to place before a large body of medical students and practitioners a concise account of urinary diseases with the methods for their investigation and treatment. The writing of a handbook on a special subject is not an easy task, but we are of opinion that the author has succeeded in this laudable effort.

The book consists of fourteen chapters, of which the first three deal with methods of urological investigations. For excretion urography, abrodil has been used throughout. Uroselectan B, which is also in general use, might have been mentioned. It is regrettable that Prof. von Lichtenberg's name has not been mentioned in this connection. The next three chapters deal with the lesions and operative procedures on the kidneys and the ureters. Other chapters deal with the surgery of the bladder and the urethra and genito-urinary tuberculosis. The two chapters on the prostate are excellent. Within the limits, imposed by the author, it is remarkable that hardly anything of importance has been left out. Chapter XIII deals with the nursing and management of the urological patient. There is a very useful appendix, containing a list of drugs and preparations, comprising a short pharmacopœia for use in urological cases.

The print and get-up are excellent and a short index is appended. We warmly recommend this excellent handbook to the notice of the senior medical student and the general practitioner.

P. N. R.

A SHORT PRACTICE OF SURGERY.—By Hamilton Bailey, F.R.C.S. (Eng.), and R. J. McNeill Love, M.S. (Lond.), F.R.C.S. (Eng.). Third Edition. 1936. H. K. Lewis and Company, Limited, London. Pp. viii plus 995, with 763 illustrations of which 88 are in colour. Price, 28s.

OWING to rapid strides in various directions, surgery has become too vast and unwieldy a subject for the average medical student. To be of real use to him, a handbook of surgery should be of a convenient size and yet include such material as is completely up to date and generally acceptable. We are of opinion that *A Short Practice of Surgery* by the two well-known writers, Bailey and Love, adequately fulfils these requirements. The fact that this excellent treatise has already gone through three editions in four years is sufficient proof of its well-deserved popularity and appreciation by the discerning. In fact, it was not unexpected, because we are accustomed to associate Bailey's name with a generous display of artistic illustrations in his usually crisp and lucid writing.

The book consists of forty-three chapters and may fairly be said to cover the whole range of surgery, which in itself is a creditable achievement in a volume of 950 pages. There are few points that might give rise to any serious divergence of opinion. A few suggestions, however, might be offered. Although the gridiron and Battle's incision are still popular for appendicectomy, a lower paramedian, particularly in the female, might be regarded as the incision of choice. It is desirable that emphasis should be laid on early diagnosis of mammary carcinoma. It is a matter of some surprise that Sayre's archaic method of treatment of a fractured clavicle should still find a place in a modern textbook of surgery. Undoubtedly, the 'three handkerchief

method' is the more efficient and may be adopted for the routine treatment of this injury.

A remarkable feature of this book consists of its 763 illustrations, of which 88 are in colour. We do not remember having seen such a fine collection of artistic illustrations in any other book of its type. It is needless to add that the pictures are nowhere redundant; they have been judiciously used with achievement of lucidity of exposition and effective economy of space. This book reflects great credit on the publishers in that they are able to offer such a high-class production for the modest sum of 28 shillings. We strongly recommend this book to medical students and their teachers.

P. N. R.

APPENDICITIS: WHEN AND HOW TO OPERATE: A GUIDE FOR THE GENERAL PRACTITIONER.—By W. J. Stewart McKay, M.B., M.Ch., B.Sc. 1936. Angus and Robertson Limited, Sidney, Australia. Pp. xii plus 260. Illustrated. Price, 12s. 6d.

THIS book has been written for the general practitioner and the young surgeon, by one who has been a practising surgeon for forty years. The author, therefore, hopes that his vast experience will be valuable to those who have only a limited experience of abdominal surgery. It is, indeed, somewhat surprising that he should make, on several occasions, some unpleasant though well-meaning remarks about them.

This monograph consists of fourteen chapters, dealing with the anatomy of the appendix, preparation of the patient, instruments and ligatures, and of the operation theatre. Other chapters deal with the after-treatment, the septic appendix and post-operative complications. There are many statements in this book that are not generally accepted; only a few of these need be mentioned. The author is of opinion that there are two important factors in the pathogenesis of appendicitis; the first is 'chill' and the second the Mendelian factors or genes, which determine an exuberance of lymphoid tissue and 'enable a parent to transmit this possession as surely as the Jew can transmit his nose to his offspring'. In the case of tuberculous mesenteric disease, a course of tuberculin is regarded as a wonderful tonic. Battle's incision has been recommended in this book, but a lower paramedian would be preferable, particularly in the female. As a pre-operative measure in case of simple appendicitis, the author always orders a dose of castor oil. For the preparation of the patient's skin a hot boric compress is applied and changed every hour for 3 or 4 hours. We regret that we are unable to agree with the author on these points.

The print and get-up are well done. We hope that the book may be of some help to those for whom it is primarily intended.

P. N. R.

MINOR SURGERY.—By Frederick Christopher, S.B., M.D., F.A.C.S. With a Foreword by Allan B. Kanavel, M.D., F.A.C.S. Third Edition, reset. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 1030. With 709 illustrations. Price, 42s.

A THIRD and revised edition of Christopher's *Minor Surgery* is now published. In a foreword, Prof. Kanavel rightly points out that 'the dividing line between major and minor surgery is often difficult to determine' and that 'too often minor surgery becomes major surgery through carelessness or incompetence'. It does not take one long to discover that this book is no mere compilation from previous texts but is somewhat of a new departure, designed to meet the requirements of both the general practitioner and the resident medical officer.

This is a volume of considerable bulk, consisting, as it does, of 1030 pages and 709 illustrations. Of the new material incorporated in this edition there is a big list, comprising such diverse subjects as recent advances in wound treatment, bacteriophage, resuscitation upon the operating table, de Takat's method of ambulatory vein

ligation, x-ray treatment of gas gangrene, Leriche treatment of sprains, and the Wangenstein stomach suction apparatus. There are twenty-four chapters in all and nearly every page is dotted with numerous references in the footnotes. The opening chapters deal with closed and open wounds. In the section on foreign bodies, the reader will be rewarded with many valuable practical tips. The omission of carbolated magnesium sulphate paste, a preparation of proved efficacy, in case of furuncles and carbuncles is rather surprising, in view of the fact that newer agents like the bacteriophage and the staphylococcal toxoid have been introduced. For the treatment of streptococcal infections, the specific chemotherapy with 'Prontosil', a Bayer product, might have found a place. The chapter on burns is excellent. There is, however, much to recommend, for routine use, Davidson's original preparation of tannic acid—a 2.5 per cent aqueous solution.

The section on head injuries is worthy of note and thoroughly practical. The authority of Dandy is unquestionable and his views are certain to command respectful attention. There are several useful chapters on injuries, infections, tumours and deformities of the neck, trunk, the upper and lower extremities and the male and female genito-urinary organs. Elliott treatment has been described for chronic pelvic inflammation in the female. The author is obviously an ardent advocate of local anaesthesia. In ano-rectal lesions, the method described by David is recommended.

The chapters on injuries to bones and joints are throughout very sound and dependable. There is, however, one glaring omission; there is no mention of Böhler's non-padded-plaster cast. The chapter on minor surgical technique will be found generally helpful. Bandaging has rightly been relegated to the background, although there is a real danger of bandaging becoming a lost art. The best chapter, which is specially devoted to the surgical intern and intended to be a *vaude mecum*, is worthy of careful perusal. An exhaustive index is also appended.

It is, altogether, an admirable production and is certainly one of the best reference books on minor surgery. It begins with an apposite motto, a quotation in French from *Maisonette*; translated it means that 'it is by the study of minor surgery that the surgeon begins his period of apprenticeship'. No better introduction to this book could have been devised.

The print and get-up are excellent and conform to the best traditions of the house of Saunders. The success of this book is assured.

P. N. R.

A GLASGOW MANUAL OF OBSTETRICS.—By S. J. Cameron, M.B., F.R.F.P.S., F.C.O.G., John Hewitt, M.B., Ch.B., F.C.O.G., R. A. Lennie, M.D., F.R.F.P.S., F.C.O.G., and E. D. Morton. Second Edition. Edward Arnold and Company, London. Pp. viii plus 611. Illustrated. Price, 21s.

THE second edition of *A Glasgow Manual of Obstetrics* makes a welcome appearance after an interval of twelve years.

The contributors and editor are members of the staff of the largest maternity hospital in Great Britain, which, dealing with 8,000 labour cases annually, and drawing its cases from an enormous slum area, has clinical material available which is probably not possessed by any other hospital in Great Britain. A book based on such clinical material is deserving of the greatest respect and careful perusal.

The book is divided into four sections—normal pregnancy, abnormal pregnancy, obstetric surgery, and the newborn child. In each chapter the authors give a clear illustrated description of the subject, and recommendations based on their experience. The illustrations are particularly clear and easy to interpret. Redundant matter has been excluded, and one is gratified not to find the older methods of resuscitating the newborn, which were more suitable for adults' physical training class than for use on a newborn infant.

The article on puerperal sepsis is admirable, and gives an impartial and well-balanced review of this important subject.

A book of this type naturally gives great scope for criticism, and all would not agree with the routine sterilization of a patient after Caesarean section—nor with the dogmatic statement that oophorectomy is definitely indicated in osteomalacia. This operation has rightly been abandoned in countries where osteomalacia is prevalent.

Whatever criticisms are made, it must be remembered that the book is based on the results of considerable experience and conclusions, and it should be read in this light.

It is strongly recommended to all practitioners, specialists in midwifery, and to students.

S. N. H.

TIME OF OVULATION IN WOMEN. A STUDY ON THE FERTILE PERIOD IN THE MENSTRUAL CYCLE.—By Carl G. Hartman. 1936. Baillière, Tindall and Cox, London. Pp. x plus 226. Illustrated. Price, 13s. 6d.

THIS book is one of the Medical Aspects of Human Fertility Series issued by the National Committee on Maternal Health, Inc., U. S. A. It is intended to inform the practitioner regarding the present state of knowledge of the time of ovulation in women, so that he may be in a position to advise patients regarding the use of the so-called 'safe period' as a birth-control measure.

The first nine chapters contain a short review of the physiology of reproduction, and are well illustrated. The later chapters deal in a critical manner with statistical and other data regarding the time of ovulation in the menstrual cycle. The author believes that much of the available information on this subject is unreliable on account of the ease with which exact dates are forgotten. Knaus' method of estimating the time of ovulation by the responsiveness of the uterus to pituitrin is discussed. The author does not consider that there is sufficient evidence to justify this worker's conclusions, that 'ovulation occurs 14 days ante menses' and that an absolutely safe period may be calculated on this basis in each individual case, but his own work on monkeys largely confirms Knaus' findings. The last chapter is devoted to the practical application of the rhythm of fertility and sterility, the existence of which has been established, although no hard-and-fast limits to the two periods can as yet be drawn. This is a balanced review of the present knowledge of an obscure subject, and should be of definite practical value.

M. N.

HYDROTHERAPY AND CLIMATOTHERAPY.—By M. B. Ray, D.S.O., M.D., M.R.C.P. 1936. Edward Arnold and Company, London. Pp. vii plus 312. Price, 12s. 6d.

TREATMENT by hydrotherapy and climatotherapy is for the most part somewhat of a luxury. It possesses advantages however in that unlike medical and surgical treatment it is usually pleasant and readily accepted by the well-to-do patient. There can be no question however that the main benefit of hydrotherapy consists in a new and regular regime of life, the drinking of the water alone often being a subsidiary feature.

Apart from about the merits of the different regimes, the book under review, ingeniously, from the pages of the book, arrange a modified 'Spa in the home' treatment. There is a good account of the effects of mineral, thermal mustard baths, hot packs, etc., and in addition the recipe for having Kreuznach and other baths in one's home is given. The effects of electrotherapy are discussed and as most large towns all over the world have some kind of apparatus of this kind such treatment should be available for all combined with some regime and artificial baths, etc.

The book should undoubtedly be of value to the practitioner whose practice does not necessarily touch those who can afford the luxury of the real thing.

H. E. C. W.

BASAL METABOLISM IN HEALTH AND DISEASE.—

By E. F. DuBois, M.D. Third Edition. 1936. Baillière, Tindall and Cox, London. Pp. 494. Illustrated with 98 engravings. Price, 22s. 6d.

THE subject of basal metabolism has during the last few years become of considerable importance in the practice of medicine. Previously it was the physiologists, the biochemists and the research workers only who had to deal with the measuring of basal metabolism and the results obtained therefrom were considered to be of academic interest only. It was for this reason that the subject of basal metabolism was looked upon with an amount of scepticism by the clinicians of the old school of thought; one of the main reasons for this scepticism was probably the fact that this subject had always been of a highly complex character and had largely been the province of a specialist.

The author, who is an authority on the subject, recognized the importance of the practical application of the principles of basal metabolism to clinical medicine about 12 years ago and with that object in view he made a very successful attempt to bring the rather intricate subject of basal metabolism out of the realm of pure physiology into the domains of clinical medicine. This he did in the first edition of this book which was published in 1924.

The clinical significance of the determination of basal metabolic rate in certain diseases is growing in importance rapidly and is now beginning to occupy a prominent place in the field of internal medicine. The information, which the measurement of the basal metabolic rate conveys, not only adds a very valuable link to the chain of evidence upon which the diagnosis of certain diseases, specially those in which a dysfunction of certain endocrine glands is suspected, rests, but it also supplies valuable data in many cases of obesity, diabetes, leukaemia, etc., giving the clinician a better understanding of the nutritive conditions and helping him to adjust the diet accordingly. Then again the time for operation in a hyperthyroid patient can be selected best by using the basal metabolic rate as a guide.

The present edition has been rearranged and rewritten in some portions in view of the latest contributions to the subject. The bibliography given at the end of the book contains references of the more recent literature on the subject.

We consider the book to be up to date, dealing with the recent developments of the subject, more particularly in its relation and application to clinical medicine. The busy clinician who has no time to read elaborate textbooks or monographs will profit considerably by the perusal of this book and will find that many of his conceptions about the subject have either undergone radical changes or suffered considerable modification.

We have no hesitation in recommending Prof. DuBois' book to all who desire to be up to date with a clear understanding of the significance and limitations of basal metabolism in health and disease.

J. P. B.

VITAMINS AND OTHER DIETARY ESSENTIALS.—

By W. R. Aykroyd, M.D. Second Edition. 1936. William Heinemann (Medical Books) Limited, London. Pp. xli plus 226. Price, 7s. 6d.

IN reviewing the first edition of this book we expressed the opinion that it was an entertaining as well as an instructive production, because the author in clear and simple language explains the principles of sound dietetics.

He also explains what vitamins are and where they are to be found in everyday articles of food so that

the reader can find out where they can be obtained naturally and cheaply.

Subsequent editions of books that largely depend on their appeal by their simplicity and brevity often lose these characters as the author seems impelled to amplify his original remarks. The author of the book under review has resisted this tendency for the alterations and additions have only led to an increase of about six-and-a-half pages. As a consequence the book retains its freshness and simplicity.

We can recommend this edition as heartily as the first to medical practitioners as an excellent introduction to the scientific study of diet, and to the housewife as a guide in the selection of the day-to-day meals of her family.

P. A. M.

WHY KEEP THEM ALIVE.—By Paul De Krulff in collaboration with Rhea De Krulff. 1936. Jonathan Cape Limited, London. Pp. 293. Price, 10s. 6d.

THIS book appears to have been written with the object of drawing attention to the relative failure of the administration in the United States of America to pass on to the public the many important life-saving and health-preserving discoveries of modern science. As it covers the period of deepest economic depression in America, the worst possible picture is painted. This has probably been done advisedly by the author because the impression left after reading the book is one of exaggeration in language and extravagance in thought.

Although the book undoubtedly contains a great deal of truth it is not the constructive and soundly-reasoned statement we consider such a criticism should be if it is to be of any value.

We do not know if the American public welcome the presentation of a serious subject in the flippant and slangy language of the cheap press, therefore we do not feel we should criticize what is a domestic matter for the citizens of the United States, but we can say that the language in the book is neither comprehensible nor pleasing (where it is understood) to the British mind. This is of little importance, however, for the book is obviously written for internal circulation in America, as much of it will not be understood by users of normal colloquial English. A few examples will illustrate this point.

'No nasty fact was camouflaged by this Pennsylvania Child Health Emergency Committee. And any stuffed-shirt booming that we-musn't-get-hysterical would have been silenced if not actually given the bum's rush'. On another page the author informs his readers he has not gone 'polyanna' and a few lines lower he describes the world as having gone 'hay-wire'. These should be sufficient to indicate the difficulties a scholar used to plain English will have in arriving at the meaning of much in the book.

The author's extravagant mode of expression at times leads him sadly astray, as when he says he is able to '.....return.....to a guzzling of vitamins in limitless abundance, according to the latest science.....'. The latest science clearly shows that certain vitamins must be used in strict moderation as their excessive consumption will produce consequences perhaps even more serious than their partial deficiency.

The final chapter is devoted to the description of the rearing of the Dionne quintuplets as an example of applied science in saving infant life. It is true that it is an excellent example of what may be accomplished by scientific medicine when not hampered by expense, but it would be economically impossible, however desirable, to apply such methods to all needy children, and this we consider indicates the shortcomings of this book, for although we are in sympathy with the author in his endeavours to show up some of the faults in modern civilization it is not possible to ignore our modern economic state in the way he counsels, without offering any alternative scheme of life.

P. A. M.

DELAFIELD AND PRUDDEN'S TEXTBOOK OF PATHOLOGY.—Revised by F. C. Wood, M.D. Sixteenth Edition. 1936. Baillière, Tindall and Cox, London. Pp. vi plus 1406, with 840 illustrations. Price, 45s.

THAT a sixteenth edition of this book has been called for within a period of fifty-one years is evidence of its popularity.

On the whole it is a good book with numerous excellent illustrations and coloured plates of morbid anatomy, but it cannot be recommended for workers in the tropics because the section on parasitology is inadequate and not very up to date. For instance it is said that acute and chronic amoebic dysentery occur frequently in the United States and Egypt and occasionally in Russia, India, Panama and the Philippines. The illustrations in this section are also of little use; as an example, the eggs of oxyuris are shown in four stages of development and without the typical asymmetrical appearance; they are much more like hookworm eggs in reality.

The system of classification of diseases is difficult to follow for one finds kala-azar disposed of in less than one page in the section on animal parasites, and malaria though dealt with at greater length is in the 'infectious diseases' between measles and whooping cough.

At the present day it is not possible for one man to write on pathology in all its aspects, therefore the thought suggests itself to the reviewer that such a book as this would be better if distinctly specialized subjects such as animal parasitology were omitted altogether and to give a few references to standard works on the subject rather than to include inadequate and often incorrect descriptions.

SQUINT TRAINING.—By M. A. Pugh, M.R.C.S. (Eng.), L.R.C.P. (Lond.). 1936. Oxford University Press, London, Humphrey Milford. Pp. viii plus 117. Illustrated. Price, 7s. 6d.

MISS PUGH's little book on squint training ought to be very welcome to the ophthalmologist as it deals with the practical aspect of squint and its treatment from the point of view of an expert in orthoptic training. The author is to be congratulated on a concise presentation of a difficult subject.

The book deals with a relatively new department of ophthalmology which the average eye specialist has neither the time nor the training to pursue. It shows how important training is in connection with the treatment of squint and how the failures attending the ordinary methods adopted may be avoided.

Various types of squint are classified in a simple way and measurement of the angle of squint dealt with. This is never an easy matter and it would appear that to attain more accuracy a knowledge of the modern training instruments is necessary.

The important group of squints associated with abnormal projection and abnormal retinal correspondence is elucidated; the frequency of this state (77 per cent in alternating squints) is noteworthy.

In dealing with methods of training the importance of occlusion is discussed and the technique of preventing amblyopia given. The author does not agree that training alone is never successful in the large group of squints with abnormal binocular projection and abnormal retinal correspondence although apparently the combination of surgery and training is best. Indications are given for selecting cases for operation. When one turns to the results of various treatments, it will be seen that operation alone is but a poor method and that for the successful treatment of squint it is necessary to combine operative methods with orthoptic training.

The appendix shows a collection of the modern amblyoscopes which may appear formidable to the ophthalmologist who has not investigated an orthoptic training department, but even without an expert in fusion training one of the major amblyoscopes such as that designed by the author is practically a necessity in an ophthalmic institution.

R. E. W.

A DOCTOR'S ODYSSEY: A SENTIMENTAL RECORD OF LE ROY CRUMMER: PHYSICIAN—AUTHOR BIBLIOPHILE—ARTIST IN LIVING 1872—1934.—By A. G. Beaman. 1935. The Johns Hopkins Press, Baltimore. Pp. vii plus 340. Price, 11s. 6d. Obtainable from the Oxford University Press, Bombay

THIS is the account of the all too short life of an exceptional physician, amplified by contributions written by a few of his closest friends. That he was an unusual and lovable character is made clear by the terms of affection and appreciation in which he is referred to by the contributors to this volume.

Early in his career Dr. Crummer visited Europe and London where he undertook post-graduate study and for which at the same time he acquired a lasting love. His fondness for things European is shown in his later years for from the date of his marriage in 1922 until he became too ill in 1929 he paid almost annual visits there in search of rare medical publications, the acquisition of which was his greatest pleasure. In making his collection he was aided and encouraged by his wife who was also a keen book collector, and together they seem to have visited and revisited all the important cities of Europe where they acquired many friends.

He was fortunate in that he was apparently able to pursue his hobby without regard to financial consideration.

As a collector he was unusual in that he was generous and gave away many of his treasures to medical institutions and universities both in America and England.

Though not widely known throughout the world of medicine as a great physician he was evidently a skilled heart specialist of considerable renown in his own sphere, and the fact that his life inspired the publication of this tribute to his memory is sufficient evidence to those who did not know him that he was a man above the average both as a physician and a lovable human being.

A book of this kind is an epitaph of which the family of any one of us might well be proud however famous we might become.

OTHER BOOKS RECEIVED

A Series of Letters on Educational Reconstruction in India. By J. C. Ghosh, n.s.c. (Manchester), f.c.s. 1936. Published by J. C. Ghosh, P. 154, Lake Road, Kalighat, Calcutta. Pp. 35. Price, As. 6

Abstracts from Reports

FIFTY-FIRST ANNUAL REPORT OF THE NATIONAL ASSOCIATION FOR SUPPLYING MEDICAL AID BY WOMEN TO THE WOMEN OF INDIA FOR THE YEAR 1935

THE year 1935 has been a memorable one in the history of the association. It celebrated its jubilee, and these fifty years of work have seen many changes and much progress. The Dufferin Fund was one of the four benevolent organizations to benefit by the Silver Jubilee Appeal. The total amount collected was Rs. 142 lakhs, out of which the sum of Rs. 7,20,000 was allotted to the Countess of Dufferin's Fund Council.

It is hoped that in the near future new officers will be recruited to help forward the work of providing medical relief to the suffering women and children of India, and that much needed buildings to house W. M. S. officers and staff will be completed. The Dufferin Hospital at Calcutta has been in a very unsatisfactory and unsafe condition for many years and part of it has been condemned as unfit for occupation. It is hoped that sufficient money will be forthcoming to erect a modern hospital which is a vital necessity in so crowded a city as Calcutta. The Dufferin Hospital at Quetta was completely destroyed by the disastrous

earthquake of May 1935. Fortunately no lives were lost among the staff and only one patient died. It is hoped that, with the money received from the Jubilee Fund and grants from other sources, a new earthquake-proof building will be erected to replace the Dufferin Hospital which has been destroyed. Quetta is the headquarters of the Dufferin work in Baluchistan which has made rapid strides in the last few years, and the loss of the hospital is specially regretted as new buildings had been put very recently.

During 1935 Her Excellency The Countess of Willingdon continued as President to take the greatest interest in the activities of the association, which is deeply indebted to her for the very practical help she has so unstintingly given in this Jubilee year.

The office of Chairman of the Council and Executive Committee was held by Sir David Petrie, C.I.E., C.V.O., C.B.E., and that of Honorary Treasurer by Sir Ernest Burdon, K.C.I.E., C.S.I., I.C.S.

The Jubilee meeting of the Council was held at the Viceroy's House on the 7th March, 1935, with Her Excellency The Countess of Willingdon in the chair. It was followed by the Annual General Meeting, at which Her Excellency presided, and His Excellency The Viceroy was present as Patron of the Fund. There was a large and representative gathering from all over India, which made it an impressive and never to be forgotten event in the history of the association. Her Excellency addressed the meeting and read the following messages from Her Majesty The Queen, and from the Dowager Marchioness of Dufferin and Ava:—

(a) 'I have learned with great pleasure that Your Excellency will preside in March at the Jubilee Meeting of the Countess of Dufferin's Fund, of which I am Patroness.

I would wish to take this opportunity of asking you to express to those present at this auspicious meeting my continued keen interest in all that affects the welfare and happiness of the Fund, and to convey to one and all my warm thanks for their loyal and ever ready support of the great movement which for 50 years has rendered invaluable help to the women of India.

May all success attend the labours of the Fund in the future, as in the past'.

(Sd.) MARY, R.I.

(b) 'Her Excellency The Lady Willingdon has kindly given me this opportunity of addressing a few words to the Central Council in the Jubilee Year of that which is still known as the Dufferin Fund.

The National Association for Supplying Medical Aid by Women to the Women of India was founded in 1885—and as I look back to the initial difficulties which the association had to face, I now realize more clearly than I have hitherto done that, except for the generous financial aid supplied, the actual success of the movement is due to the unexpected way in which the Indian women came forward to take up medicine as a profession. From that time the supply of students has never failed, though it must have required remarkable courage and determination in those young women who elected to leave their home and the sunny climate of their own land to study in the more gloomy atmosphere of English, Scotch and Irish Medical Schools, and finally to take English qualifications and a place on the English Medical Register.

These pioneer women had their reward when in 1913 the Indian Government established a Women's Medical Service for 25 fully qualified women doctors, a number which has now been increased to 50. Thus has their achievement been crowned, and I think they may further claim the Lady Hardinge College as a result of their professional zeal and success.

At this College Indian women students can now qualify, and it is greatly to their advantage that they can do so in their own country, though I trust that the system which has been so successful these last 50 years will continue to be followed to a certain extent. Indian women students can now qualify in India, but that they should spend some time in Great Britain so as to acquaint themselves with the methods, the equipment,

the discipline of our older established hospitals is, I am sure, very desirable for them.

I must also express a fervent hope that fully qualified Indian and English women doctors working in sisterly and professional friendship will for many a long year share the great work which remains to be accomplished. Fifty years is, after all, but a beginning of that which this National Association set out to do, namely, to supply every woman in India with all that medical skill can do for her health and for that of her children.

As President of the United Kingdom Branch of the Dufferin Fund, I retain a link with the work of the association which I greatly value, and with all my heart I wish it God speed'.

(Sd.) HARIOT DUFFERIN AND AVA.

His Excellency The Right Hon'ble Freeman Freeman-Thomas, Earl of Willingdon, P.C., G.M.S.I., G.M.I.E., G.C.M.G., Viceroy and Governor-General of India, Patron in India of the Association, addressed the meeting as follows:—

Your Excellency, Ladies and Gentlemen: Of the many invitations I have received to speak on public occasions, I can recall hardly any which I have accepted with greater good-will than that which brings me here to address you to-day. The present is your fiftieth annual general meeting and so marks the jubilee of the Countess of Dufferin's Fund which you are met here to celebrate. Let me assure you, at the outset, that it gives me the greatest pleasure to be able to be here to-day and to share your legitimate feeling of satisfaction and pride on so notable and auspicious an occasion.

2. Fifty years is a long time in the life of any organization and its completion affords a natural opportunity for those who compose it to cast an eye not only backwards on the past but forwards on the future. In the case of a benevolent society such as yours, that process can bring you no searching of heart or conscience, for your labours have been devoted wholly to the alleviation of suffering among the women of India at large; and if there is dissatisfaction at all, it can only be that your resources for such public service have not always been adequate to the immense field of opportunity confronting you. Even that dissatisfaction, moreover, can only serve, on such an occasion as this, to stimulate your minds to consider how you can, in the new era opening up before you, extend and, if possible, improve upon, the great record of public service, for which India owes you so much, and of which I to-day am glad to be able to make public and unstinted acknowledgment.

3. Your Society has the unique honour of having as its Patron the Queen Empress of India, and, as its Lady President, the wife of the Viceroy for the time being. That association of names and offices is far from being fortuitous or meaningless. On the contrary, it has both historical interest and present-day significance. When the Countess of Dufferin came out to India as the wife of the then Viceroy she was specially charged by Queen Victoria to do all that might be possible to help her daughters, the women of India, in their hour of need. Queen Victoria had been told, during personal interviews, by two famous pioneer medical women, Dr. Elizabeth Bielby and Dr. Mary Scharlieb, of the terrible and unrelieved sufferings of Indian women during sickness. So well did Lady Dufferin carry out the wishes of her Sovereign and so great was the enthusiasm she brought to her task, that in three years she collected in India seven lakhs of rupees, of which five and a half were invested in buildings, grants-in-aid and scholarships. During the same period the United Kingdom Branch collected three lakhs of rupees. Your records bear witness how devotedly Lady Dufferin laboured for the fund during the whole five years of her stay in this country. Over your meetings which were held once a week Her Excellency, as a rule, presided. It is not the least of your reasons for rejoicing to-day that this lady of beloved and revered memory is still amongst your most active workers and is able to preside at meetings of the United Kingdom

Branch. I am glad to know that your message of jubilee greetings, which she has so well earned must be now in her hands. In that homage and gratitude your founder will find a reward which many may envy but none will grudge her. It is not too much to say that the successors of Queen Victoria and Lady Dufferin have faithfully followed the high example set them, and have been unwearied in their efforts to see that there should be no slackening or falling-off. The messages of congratulation and greeting from Her Majesty and Lady Dufferin to which you must have listened with so much pleasure show that the trust handed down from early days is in capable and willing hands. How well that trust has been always discharged the meeting at which we are present here to-day furnishes evidence of a kind that is not open to dispute.

4. The first general meeting of the fund was held in Calcutta in January 1886. On that occasion His Excellency the Earl of Dufferin and Ava presided and made a memorable speech. One sentence from it is worth my repeating here:—

‘The sickness of a man indeed may mean loss of employment and many distressing consequences to him; but the ill health of the women of a household is tantamount to perpetual domestic wretchedness and discomfort as well as a degradation in the strength and virility of subsequent generations’.

These are arresting words, and I have no reason to think that their import is lost on you any more to-day than it was on your predecessors in the past, or will be on your successors in future.

5. This is no occasion on which to weary you with statistical details as to the progress and success of your work, though in this case they have a vital human interest denied to many other fields of activity. When your fund came into existence fifty years ago, it was truly said that unless you provided women doctors, a large portion of the women of India must go without doctors at all. It is worth while to mention, then, that, whereas fifty years ago the association knew of only 24 women doctors practising in the whole of India and Burma, we have 50 years later 26 qualified women working in the Zenana hospitals of Delhi and New Delhi alone. The Association of Medical Women in India now has about 300 members, and it is reasonably certain that there cannot be less than 700 registered women doctors in the country. The progress in the medical education of women during the 50 years of your existence provides solid ground for present satisfaction and future hope, and for this result the pioneer work done by the Countess of Dufferin's Fund deserves its full measure of credit. It is difficult to overstate the changes that have resulted. As medical knowledge and the art of nursing grew, prejudices were broken down and women patients came forward in ever increasing numbers to claim relief. We have here in New Delhi a notable monument to progress in the shape of the Lady Hardinge Medical College for Women, which aptly shows how earnestly supply has endeavoured to keep pace with demand. The pity is that funds have not been available in proportion. The year 1914 saw the institution of the Women's Medical Service, financed by a grant from the Government of India, but as an integral part of the Dufferin Fund. This has assured to the Dufferin Hospitals a staff of highly qualified medical women and has effected a great improvement in nursing and equipment, while the financial relief so afforded has enabled local committees to devote their money to other needed improvements. The broad facts may be left to speak for themselves. Suffice it to say that in 1914 there were 13,271 patients in hospitals staffed by W. M. S. women, while in 1933 the figure was 47,507.

6. And now as to the future, which is largely dependent on finance. Your society, in common with others, has suffered heavily from the decline in the rate of interest earned by your securities. The Government of India, beset with their own financial difficulties, were compelled to cut down their grant to you by Rs. 40,000 per annum. The loss was inevitable, but I confess I

can think of few causes which, with the advent of better times, should have a stronger claim than yours on Government's improved finances. But it will not be enough to bring things up to the former standard. There must be expansion, otherwise there is the risk of slackening and deterioration. Your needs are many—rebuilding of hospitals, more officers, better equipment, and improved facilities for training—all these cry aloud for support. I am happy to think that your association has been specially selected as one of the beneficiaries of the King-Emperor's Jubilee Fund, for which I have recently launched an appeal and of which your Lady President is acting as Chief Organizer. It is my earnest wish and hope that the heartiness of the response to that appeal will be commensurate with the excellence of the objects to which the proceeds will be devoted, and will enable you in the years to come to surpass even the fifty years of devoted and admirable public work which you are proud to be able to put to your credit to-day.

7. It remains for me only to deliver to you a brief but heartfelt message on this notable occasion. On behalf of all the suffering thousands of India's women who have benefited from your fifty years of work, let me say a very sincere ‘Thank You’ for the past, and an equally earnest ‘God Speed’ for the future. No good citizen will wish to offer you less either in the way of thanks or good wishes. In these days of enthusiasm for democracy and democratic institutions, it is not out of place to remember how abreast of the times you always have been in this respect. Any one who chooses to pay the modest sum of Rs. 5 per annum is entitled to attend your annual general meeting and to vote on your proceedings and policy. Here surely is a truly democratic institution which deserves far wider support than it has yet found, the more so as it labours disinterestedly and unweariedly for the public good in a way to which few others can lay claim. If the duties and responsibilities of democracy were kept as much before the public mind as its supposed privileges, you would have less cause to complain of lack of public sympathy or of the financial support which you so urgently need for the increasing demands which are bound to be made on you. These demands, I cannot doubt, will be met in the same high and humane spirit which has animated you during your whole public life of fifty years. Let me once more offer you my sincere thanks for the past, my earnest good wishes for the future and my warm congratulations on the attainment of your jubilee.

REPORT OF THE CHEMICAL EXAMINER TO GOVERNMENT, PUNJAB, FOR THE YEAR 1935

The modern scientific investigation of crime

POLICE science has received its proper place in the lawful administration of continental countries for many years with the inevitable result that their methods for the scientific detection of crime are far in advance of those of Great Britain. Not only in the capitals of Europe but in many provincial towns such as Lyons, Lusanne, Munich, Turin, Milan, Barcelona, etc., there are well equipped and properly staffed medico-legal institutes where selected members of the police can actually see material being examined and police problems elucidated.

Professor Söderman, an eminent European criminologist who is Head of the Institute of Police Science at the University of Stockholm, was recently brought over to America by the American Swedish Foundation of Stockholm and delivered a course of lectures at the New York Police Academy. In collaboration with the Dean of this Academy, he published an excellent book called *Modern Criminal Investigation*. The Police Commissioner of New York has written a short introduction to this book in which he says that ‘police practice has long felt the inadequacy of mere experience and is now reaching out for all the help that can be obtained from all the growing sciences. Prevention of crime and the detection and apprehension of criminals are rapidly becoming technical processes’.

earthquake of May 1935. Fortunately no lives were lost among the staff and only one patient died. It is hoped that, with the money received from the Jubilee Fund and grants from other sources, a new earthquake-proof building will be erected to replace the Dufferin Hospital which has been destroyed. Quetta is the headquarters of the Dufferin work in Baluchistan which has made rapid strides in the last few years, and the loss of the hospital is specially regretted as new buildings had been put very recently.

During 1935 Her Excellency The Countess of Willingdon continued as President to take the greatest interest in the activities of the association, which is deeply indebted to her for the very practical help she has so unstintingly given in this Jubilee year.

The office of Chairman of the Council and Executive Committee was held by Sir David Petrie, C.I.E., C.V.O., C.B.E., and that of Honorary Treasurer by Sir Ernest Burdon, K.C.I.E., C.S.I., I.C.S.

The Jubilee meeting of the Council was held at the Viceroy's House on the 7th March, 1935, with Her Excellency The Countess of Willingdon in the chair. It was followed by the Annual General Meeting, at which Her Excellency presided, and His Excellency The Viceroy was present as Patron of the Fund. There was a large and representative gathering from all over India, which made it an impressive and never to be forgotten event in the history of the association. Her Excellency addressed the meeting and read the following messages from Her Majesty The Queen, and from the Dowager Marchioness of Dufferin and Ava:—

(a) 'I have learned with great pleasure that Your Excellency will preside in March at the Jubilee Meeting of the Countess of Dufferin's Fund, of which I am Patroness.

I would wish to take this opportunity of asking you to express to those present at this auspicious meeting my continued keen interest in all that affects the welfare and happiness of the Fund, and to convey to one and all my warm thanks for their loyal and ever ready support of the great movement which for 50 years has rendered invaluable help to the women of India.

May all success attend the labours of the Fund in the future, as in the past'.

(Sd.) MARY, R.I.

(b) 'Her Excellency The Lady Willingdon has kindly given me this opportunity of addressing a few words to the Central Council in the Jubilee Year of that which is still known as the Dufferin Fund.

The National Association for Supplying Medical Aid by Women to the Women of India was founded in 1885—and as I look back to the initial difficulties which the association had to face, I now realize more clearly than I have hitherto done that, except for the generous financial aid supplied, the actual success of the movement is due to the unexpected way in which the Indian women came forward to take up medicine as a profession. From that time the supply of students has never failed, though it must have required remarkable courage and determination in those young women who elected to leave their home and the sunny climate of their own land to study in the more gloomy atmosphere of English, Scotch and Irish Medical Schools, and finally to take English qualifications and a place on the English Medical Register.

These pioneer women had their reward when in 1913 the Indian Government established a Women's Medical Service for 25 fully qualified women doctors, a number which has now been increased to 50. Thus has their achievement been crowned, and I think they may further claim the Lady Hardinge College as a result of their professional zeal and success.

At this College Indian women students can now qualify, and it is greatly to their advantage that they can do so in their own country, though I trust that the system which has been so successful these last 50 years will continue to be followed to a certain extent. Indian women students can now qualify in India, but that they should spend some time in Great Britain so as to acquaint themselves with the methods, the equipment,

the discipline of our older established hospitals is, I am sure, very desirable for them.

I must also express a fervent hope that fully qualified Indian and English women doctors working in sisterly and professional friendship will for many a long year share the great work which remains to be accomplished. Fifty years is, after all, but a beginning of that which this National Association set out to do, namely, to supply every woman in India with all that medical skill can do for her health and for that of her children.

As President of the United Kingdom Branch of the Dufferin Fund, I retain a link with the work of the association which I greatly value, and with all my heart I wish it God speed'.

(Sd.) HARIOT DUFFERIN AND AVA.

His Excellency The Right Hon'ble Freeman Freeman-Thomas, Earl of Willingdon, P.C., G.M.S.I., G.M.I.E., G.C.M.G., Viceroy and Governor-General of India, Patron in India of the Association, addressed the meeting as follows:—

Your Excellency, Ladies and Gentlemen: Of the many invitations I have received to speak on public occasions, I can recall hardly any which I have accepted with greater good-will than that which brings me here to address you to-day. The present is your fiftieth annual general meeting and so marks the jubilee of the Countess of Dufferin's Fund which you are met here to celebrate. Let me assure you, at the outset, that it gives me the greatest pleasure to be able to be here to-day and to share your legitimate feeling of satisfaction and pride on so notable and auspicious an occasion.

2. Fifty years is a long time in the life of any organization and its completion affords a natural opportunity for those who compose it to cast an eye not only backwards on the past but forwards on the future. In the case of a benevolent society such as yours, that process can bring you no searching of heart or conscience, for your labours have been devoted wholly to the alleviation of suffering among the women of India at large; and if there is dissatisfaction at all, it can only be that your resources for such public service have not always been adequate to the immense field of opportunity confronting you. Even that dissatisfaction, moreover, can only serve, on such an occasion as this, to stimulate your minds to consider how you can, in the new era opening up before you, extend and, if possible, improve upon, the great record of public service, for which India owes you so much, and of which I to-day am glad to be able to make public and unstinted acknowledgment.

3. Your Society has the unique honour of having as its Patron the Queen Empress of India, and, as its Lady President, the wife of the Viceroy for the time being. That association of names and offices is far from being fortuitous or meaningless. On the contrary, it has both historical interest and present-day significance. When the Countess of Dufferin came out to India as the wife of the then Viceroy she was specially charged by Queen Victoria to do all that might be possible to help her daughters, the women of India, in their hour of need. Queen Victoria had been told, during personal interviews, by two famous pioneer medical women, Dr. Elizabeth Bielby and Dr. Mary Scharlieb, of the terrible and unrelieved sufferings of Indian women during sickness. So well did Lady Dufferin carry out the wishes of her Sovereign and so great was the enthusiasm she brought to her task, that in three years she collected in India seven lakhs of rupees, of which five and a half were invested in buildings, grants-in-aid and scholarships. During the same period the United Kingdom Branch collected three lakhs of rupees. Your records bear witness how devotedly Lady Dufferin laboured for the fund during the whole five years of her stay in this country. Over your meetings which were held once a week Her Excellency, as a rule, presided. It is not the least of your reasons for rejoicing to-day that this lady of beloved and revered memory is still amongst your most active workers and is able to preside at meetings of the United Kingdom

Branch. I am glad to know that your message of jubilee greetings, which she has so well earned must be now in her hands. In that homage and gratitude your founder will find a reward which many may envy but none will grudge her. It is not too much to say that the successors of Queen Victoria and Lady Dufferin have faithfully followed the high example set them, and have been unwearied in their efforts to see that there should be no slackening or falling-off. The messages of congratulation and greeting from Her Majesty and Lady Dufferin to which you must have listened with so much pleasure show that the trust handed down from early days is in capable and willing hands. How well that trust has been always discharged the meeting at which we are present here to-day furnishes evidence of a kind that is not open to dispute.

4. The first general meeting of the fund was held in Calcutta in January 1886. On that occasion His Excellency the Earl of Dufferin and Ava presided and made a memorable speech. One sentence from it is worth my repeating here:—

'The sickness of a man indeed may mean loss of employment and many distressing consequences to him; but the ill health of the women of a household is tantamount to perpetual domestic wretchedness and discomfort as well as a degradation in the strength and virility of subsequent generations'.

These are arresting words, and I have no reason to think that their import is lost on you any more to-day than it was on your predecessors in the past, or will be on your successors in future.

5. This is no occasion on which to weary you with statistical details as to the progress and success of your work, though in this case they have a vital human interest denied to many other fields of activity. When your fund came into existence fifty years ago, it was truly said that unless you provided women doctors, a large portion of the women of India must go without doctors at all. It is worth while to mention, then, that, whereas fifty years ago the association knew of only 24 women doctors practising in the whole of India and Burma, we have 50 years later 26 qualified women working in the Zenana hospitals of Delhi and New Delhi alone. The Association of Medical Women in India now has about 300 members, and it is reasonably certain that there cannot be less than 700 registered women doctors in the country. The progress in the medical education of women during the 50 years of your existence provides solid ground for present satisfaction and future hope, and for this result the pioneer work done by the Countess of Dufferin's Fund deserves its full measure of credit. It is difficult to overstate the changes that have resulted. As medical knowledge and the art of nursing grew, prejudices were broken down and women patients came forward in ever increasing numbers to claim relief. We have here in New Delhi a notable monument to progress in the shape of the Lady Hardinge Medical College for Women, which aptly shows how earnestly supply has endeavoured to keep pace with demand. The pity is that funds have not been available in proportion. The year 1914 saw the institution of the Women's Medical Service, financed by a grant from the Government of India, but as an integral part of the Dufferin Fund. This has assured to the Dufferin Hospitals a staff of highly qualified medical women and has effected a great improvement in nursing and equipment, while the financial relief so afforded has enabled local committees to devote their money to other needed improvements. The broad facts may be left to speak for themselves. Suffice it to say that in 1914 there were 13,271 patients in hospitals staffed by W. M. S. women, while in 1933 the figure was 47,507.

6. And now as to the future, which is largely dependent on finance. Your society, in common with others, has suffered heavily from the decline in the rate of interest earned by your securities. The Government of India, beset with their own financial difficulties, were compelled to cut down their grant to you by Rs. 40,000 per annum. The loss was inevitable, but I confess I

can think of few causes which, with the advent of better times, should have a stronger claim than yours on Government's improved finances. But it will not be enough to bring things up to the former standard. There must be expansion, otherwise there is the risk of slackening and deterioration. Your needs are many—rebuilding of hospitals, more officers, better equipment, and improved facilities for training—all these cry aloud for support. I am happy to think that your association has been specially selected as one of the beneficiaries of the King-Emperor's Jubilee Fund, for which I have recently launched an appeal and of which your Lady President is acting as Chief Organizer. It is my earnest wish and hope that the heartiness of the response to that appeal will be commensurate with the excellence of the objects to which the proceeds will be devoted, and will enable you in the years to come to surpass even the fifty years of devoted and admirable public work which you are proud to be able to put to your credit to-day.

7. It remains for me only to deliver to you a brief but heartfelt message on this notable occasion. On behalf of all the suffering thousands of India's women who have benefited from your fifty years of work, let me say a very sincere 'Thank You' for the past, and an equally earnest 'God Speed' for the future. No good citizen will wish to offer you less either in the way of thanks or good wishes. In these days of enthusiasm for democracy and democratic institutions, it is not out of place to remember how abreast of the times you always have been in this respect. Any one who chooses to pay the modest sum of Rs. 5 per annum is entitled to attend your annual general meeting and to vote on your proceedings and policy. Here surely is a truly democratic institution which deserves far wider support than it has yet found, the more so as it labours disinterestedly and unweariedly for the public good in a way to which few others can lay claim. If the duties and responsibilities of democracy were kept as much before the public mind as its supposed privileges, you would have less cause to complain of lack of public sympathy or of the financial support which you so urgently need for the increasing demands which are bound to be made on you. These demands, I cannot doubt, will be met in the same high and humane spirit which has animated you during your whole public life of fifty years. Let me once more offer you my sincere thanks for the past, my earnest good wishes for the future and my warm congratulations on the attainment of your jubilee.

REPORT OF THE CHEMICAL EXAMINER TO GOVERNMENT, PUNJAB, FOR THE YEAR 1935

The modern scientific investigation of crime

POLICE science has received its proper place in the lawful administration of continental countries for many years with the inevitable result that their methods for the scientific detection of crime are far in advance of those of Great Britain. Not only in the capitals of Europe but in many provincial towns such as Lyons, Lusanne, Munich, Turin, Milan, Barcelona, etc., there are well equipped and properly staffed medico-legal institutes where selected members of the police can actually see material being examined and police problems elucidated.

Professor Söderman, an eminent European criminologist who is Head of the Institute of Police Science at the University of Stockholm, was recently brought over to America by the American Swedish Foundation of Stockholm and delivered a course of lectures at the New York Police Academy. In collaboration with the Dean of this Academy, he published an excellent book called *Modern Criminal Investigation*. The Police Commissioner of New York has written a short introduction to this book in which he says that 'police practice has long felt the inadequacy of mere experience and is now reaching out for all the help that can be obtained from all the growing sciences. Prevention of crime and the detection and apprehension of criminals are rapidly becoming technical processes'.

The authors (one of whom is a Deputy Chief Inspector of Police) also mention in their book that 'the police laboratory, serving as an educational institution for the police force, teaches not only the rules for evaluating details and working in a methodical and scientific manner, but also how technical evidence, growing more and more important year after year, must be handled'.

It may interest some of my readers if I give a brief description of what is done for the scientific training of the police force in some of the countries of Europe. Professor Neves, Director of the Lisbon Medico-Legal Institute, visited in 1933 similar institutes in France, Belgium, Germany, Austria and Italy. His observations are described in full in volume IV of the *Archivo de Medicina Legal* but I am giving only an extract from volume I, paragraph III (1933), of the *Medico-Legal and Criminological Review* of the Medico-Legal Society in London.

France

The police force is divided into administrative (street work, etc.) and judicial (detective work), and it is with the latter that the medico-legal institutes are closely connected. The rôle of the French judicial police is to 'detect crime, collect proofs and hand the authors up to justice'. To enable them to do this efficiently, they are given a course of lectures in medico-legal criminology with practical laboratory work, in addition to the usual police subjects.

Germany

Here again the police force is divided into administrative and criminal. The criminal branch is again divided into ten divisions which specialize in the detection of different kinds of crime. Their technical training is taken at the Berlin Police Institute and among the subjects taught are psychology of crime, legal medicine, chemistry, x-rays and identification of teeth.

He pointed out that the end in view was the establishment of a central medico-legal institute with regional laboratories in the main provincial towns. These regional laboratories would collect material from their districts, deal with some of it and forward the more important work to the central institute. The proposal was under consideration when I left London last October.

India

There is probably no police force in the world whose energies at times are so taxed, both on the administrative side and on the criminal side, as the Indian police. Their service is a continuous vigil against crime of all sorts. Every day in the year a continuous string of constables with exhibits come to my department and the place resembles a police station more than a chemical laboratory. There is no country where there is so great a variety of crime; one day the police are chasing dacoits, the next day they are investigating a poison or a murder case whilst on the third day they are dealing with a cocaine smuggler, a counterfeiter of coins or a gang of terrorists manufacturing explosives. There is no country where the police are more entitled to receive every assistance from science. Unfortunately they seldom realize how science can help them for they have not been taught the rudiments of scientific investigation. To my knowledge, many a murder case has been badly fumbled due to lack of observation, not to speak of improper care of exhibits.

As a nation we are very proud of our British courts of law and our deep sense of justice. To bring criminals to these courts and administer proper justice we must have a well trained scientifically minded police force and there should be no price too dear to pay to achieve this object.

'Fiat justitia, ruat coelum'.

[The above is a note appended to the report and by the Chemical Examiner.]

plantations. On one of these, malaria was particularly intense at the commencement of the experiment; the parasite rate was about 60 per cent, and no less than 10 per cent of *Anopheles umbrosus*, captured on the estate, were found to be infected. Any definite conclusions would be premature, but a comparison of results in the atebirin, quinine, and control groups would seem to indicate that, up to the end of the year, atebirin has been relatively effective. The results with quinine have been better than anticipated, and when these experiments are completed, the findings should throw considerable light on its prophylactic value. The utilization of quinine in this manner has always found favour in certain parts of Africa, though it has had little vogue in Malaya.

The cost of atebirin prophylaxis is relatively high, but as the dosage was fixed in Geneva to obtain comparison between results from several countries, it has not yet been possible to investigate the prophylactic efficacy of atebirin when given in smaller dosage. Such an experiment will be undertaken on other suitable estates in the near future.

Night trapping has been extensively practised in the continuation of the Selangor coast survey. Nearly 6,000 anophelines have been taken, of which some 4,500 have been dissected. At Rantau Panjang only one *A. sudaicus* in 2,160 and one *A. barbirostris* in 230 have been found infected. On the other hand, at Jeram, positive findings were obtained from 11 *A. barbirostris* in 980 and one *A. umbrosus* in 240. In the latter locality, *A. barbirostris* is thus an important carrier, but at Rantau Panjang the low infection rate of *A. sudaicus* has occasioned surprise.

The changing incidence of rural ('K') typhus is of considerable interest. The relatively small number of cases diagnosed clinically in estate hospitals is not available, but the numbers diagnosed serologically from Government and estate hospitals show no serious increase over the last five years. From 1931 to 1933 inclusive, these cases totalled about 180 annually, and, though that figure increased to 225 in 1934, there was a fall to 164 in the year under review. In the earlier days of typhus investigations it appeared that cases came largely from oil palm estates. Indeed, it is usual for this disease to manifest itself when new plantations reach the fruiting stage, and for the incidence to continue at a fairly high level. It is becoming established, however, that there is a tendency towards a decrease in the number of cases when such plantations have been in bearing for some years. There is no decrease in the rat population, nor is immunity general among the labour force—the annual turnover of labour precludes immunization by infection in more than a fraction of the population. The downward trend in incidence is more likely due to the development of oecological conditions that mitigate against human infection.

On the other hand, there is an increase in the number of cases occurring on rubber estates, where cover crops afford harbourage for rats. The infection is now known to be widely distributed over the country although many areas may yield only one or two sporadic cases at long intervals.

Further definite progress is recorded in the researches on tropical typhus which, in the early part of the year, were undertaken by Drs. R. Lewthwaite and S. R. Savor, and after the 11th May, when the former proceeded on leave, were continued by the latter. The outstanding finding for the year has been the carriage of rural ('K') virus by *Xenopsylla cheopis*. In 1934 experiments, designed to test the efficacy of this vector, were attended by negative results, but the carriage of 'K' virus by this flea from guinea-pig to guinea-pig has now been effected. It is, however, improbable that this vector is of epidemiological importance. Important researches are recorded in connection with prophylactic vaccines and the immunizing value of rickettsial suspensions. The protective value of convalescent serum has also been the subject of experiment and attempts to immunize a horse are *en train*. A very important factor in the evaluation of immunity is the

dosage of test virus, and much time has been expended on methods for the approximate estimation of the minimal infective dose. A finding that the virus, in the peritoneal exudate of guinea-pigs, will survive storage at 0°C. for eleven days, with little diminution in potency, should find useful application.

The potential danger of large rat populations is an axiom in tropical hygiene, while the material damage by these pests to paddy and to oil palm fruit is almost incalculable. In some areas rats are now attacking the inflorescences of the palms: even on small estates the annual kill of these rodents may number 100,000. The magnitude of such kills is indicative of the immensity of the problem that confronts both health authorities and agricultural interests. It is gratifying to record that the Vegetable Oil Section of the United Planting Association of Malaya is making a contribution towards the cost of a rat virus enquiry to be undertaken by this institute. The difficulties to be faced in this connection are recognized. The precipitation of an epidemic will be no easy matter, and the possible danger to public and animal health by the indiscriminate use of the enteritidis or pasteurilla groups is fully realized. But if causation of even a minor epidemic among rats is found possible, it is not improbable that large numbers will migrate back to the jungle, thus affording at any rate some temporary relief. There is a Malayan record of the infection of an infant with *Trypanosoma lewisi*, but the infection disappeared without specific treatment within a week or two. It is not considered that the augmentation of virulence to rats of this trypanosome would endanger human life and, as a first line of approach, an attempt has been made to increase virulence by passage through *X. cheopis*. However, the first attempt was unsuccessful.

The enquiry will take the form of an investigation into naturally occurring diseases of local rats, and of experimental work on the production of epidemics by various means. If time permits, methods for poisoning and other modes of rat destruction will also be considered.

The all important question of nutrition, with its practical bearing on the health of the community, continues to receive attention. In the early days of vitamin research, the investigations of Drs. H. Fraser and A. T. (now Sir Thomas) Stanton on beri-beri at this institute were all to the fore, and deficiency diseases have continued to interest the staff. Dr. I. A. Simpson, who worked for some time on the production of therapeutic rice polishing extracts, has now turned his attention to the question of palm oil. The commodity has a considerable carotene content—considered to be a precursor of vitamin A—and, as there is clinical evidence that many of the local population are on the border of definite deficiency, attempts are being made to popularize the use of palm oil in dietary. As an energy supply, its value is unquestionable and the carotene content should prove a most important adjunct, particularly for children. The investigations now proceeding bear on the effect of refining on carotene content and on methods for the isolation of carotene.

Of recent years the country's milk supply has been increasingly supervised, from the points of view of both bacteriological and chemical standards. It may be said that bovine tuberculosis is almost unknown. But although a few dairies furnish a bacteriologically excellent milk, the smaller vendors market a product which bacteriologically is very impure. The effect of the continuously high temperature on bacterial proliferation is, of course, an adverse factor and chilling and cold storage are outside the economic resources of the small milkman.

Adulteration, especially important from the hygienic standpoint because dilution is often practised with polluted well or drain water, has been kept in check by chemical analysis; but this mode of approach is not without limitation. Much of the local milk is from the buffalo and is thus normally richer in solids, other than milk fat, than that from the cow. But it is impracticable to prescribe separate standards on account of identificational difficulties. After experimentation

The authors (one of whom is a Deputy Chief Inspector of Police) also mention, in their book that 'the police laboratory, serving as an educational institution for the police force, teaches not only the rules for evaluating details and working in a methodical and scientific manner, but also how technical evidence, growing more and more important year after year, must be handled'.

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Austria

The course of technical instruction for the police is particularly interesting and well conceived though heavy and takes four terms. A preliminary university education is necessary.

Among the subjects in each term are :—

- I .. (a) Effect of occupation on the skin.
(b) Microscopy of substances.
- II .. (a) Elementary chemistry.
(b) Examination of textiles and metals.
- III .. (a) Medical experts' reports.
(b) Outlines of forensic toxicology and auxiliary sciences.
- IV .. (a) Forensic chemistry.
(b) Preservation of exhibits, etc.

Italy

The instruction of the Italian judicial police is very thorough indeed and includes, among its subjects, the technique of detection (36 lessons and 48 hours' practical work) as well as a course of twelve lectures with demonstrations in forensic medicine. The training in this country is carried out on very practical lines.

Great Britain

I believe Scotland Yard hold a junior and a senior officers' course every year to which overseas candidates are eligible to attend. The course is short and is confined to a few lectures and cannot be compared with the instructions given on the continent. Recently a metropolitan police college has been opened at Hendon which is primarily a training institution for recruits to the London police. The laboratory is lavishly equipped and efficiently staffed, and the cadets are given a course of training before being finally drafted out on a probationary period of field work.

When I was at home last year, I discussed with one of the officials at the Home Office the prospects for the training of the police force in Great Britain generally.

He pointed out that the end in view was the establishment of a central medico-legal institute with regional laboratories in the main provincial towns. These regional laboratories would collect material from their districts, deal with some of it and forward the more important work to the central institute. The proposal was under consideration when I left London last October.

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ANNUAL REPORT OF THE INSTITUTE FOR MEDICAL RESEARCH, FEDERATED MALAY STATES, FOR THE YEAR 1935. BY A. NEAVE KINGSBURY, DIRECTOR

GENERAL REVIEW

ALTHOUGH the funds allocated to the institute for 1935 were on much the same depleted scale as previously, it was possible to complete the year without serious monetary stint, owing to the absence on furlough of a number of senior officers.

Despite the shortage of senior officers, considerable research work has been undertaken. Dr. J. W. Field, in collaboration with Dr. J. C. Niven, has made a comparison of the therapeutic value of atebirin musonat, atebirin and quinine on a series of acute malaria cases approximating to 600 in number. The findings indicate that atebirin musonat is a valuable drug, particularly perhaps for benign tertian infections, though severe nervous symptoms, following treatment, have been noted in two subtertian cases. There are indications, however, of recurrence of infection after the completion of treatment. Five further cases of psychoses following the exhibition of atebirin are recorded. The renal excretion of atebirin has received attention; under ultra-violet light it is possible to recognize its fluorescence to a dilution of one in two million. Long continued excretion has been confirmed, and, in one case, atebirin was demonstrated in the urine on the 41st day after the completion of a seven-day course totalling 2.1 grammes. Urinary examination has also established that renal excretion commences almost as rapidly after intramuscular as after intravenous medication.

A second and very important investigation by these officers is an extensive trial of atebirin and quinine as clinical prophylactics. This research is being undertaken, in collaboration with the Malaria Commission of the League of Nations, on the population of two selected

plantations. On one of these, malaria was particularly intense at the commencement of the experiment; the parasite rate was about 60 per cent, and no less than 10 per cent of *Anopheles umbrosus*, captured on the estate, were found to be infected. Any definite conclusions would be premature, but a comparison of results in the atebirin, quinine, and control groups would seem to indicate that, up to the end of the year, atebirin has been relatively effective. The results with quinine have been better than anticipated, and when these experiments are completed, the findings should throw considerable light on its prophylactic value. The utilization of quinine in this manner has always found favour in certain parts of Africa, though it has had little vogue in Malaya.

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The changing incidence of rural ('K') typhus is of considerable interest. The relatively small number of cases diagnosed clinically in estate hospitals is not available, but the numbers diagnosed serologically from Government and estate hospitals show no serious increase over the last five years. From 1931 to 1933 inclusive, these cases totalled about 180 annually, and, though that figure increased to 225 in 1934, there was a fall to 164 in the year under review. In the earlier days of typhus investigations it appeared that cases came largely from oil palm estates. Indeed, it is usual for this disease to manifest itself when new plantations reach the fruiting stage, and for the incidence to continue at a fairly high level. It is becoming established, however, that there is a tendency towards a decrease in the number of cases when such plantations have been in bearing for some years. There is no decrease in the rat population, nor is immunity general among the labour force—the annual turnover of labour precludes immunization by infection in more than a fraction of the population. The downward trend in incidence is more likely due to the development of ecological conditions that mitigate against human infection.

On the other hand, there is an increase in the number of cases occurring on rubber estates, where cover crops afford harbourage for rats. The infection is now known to be widely distributed over the country although many areas may yield only one or two sporadic cases at long intervals.

Further definite progress is recorded in the researches on tropical typhus which, in the early part of the year, were undertaken by Drs. R. Lewthwaite and S. R. Savoor, and after the 11th May, when the former proceeded on leave, were continued by the latter. The outstanding finding for the year has been the carriage of rural ('K') virus by *Xenopsylla cheopis*. In 1934 experiments, designed to test the efficacy of this vector, were attended by negative results, but the carriage of 'K' virus by this flea from guinea-pig to guinea-pig has now been effected. It is, however, improbable that this vector is of epidemiological importance. Important researches are recorded in connection with prophylactic vaccines and the immunizing value of rickettsial suspensions. The protective value of convalescent serum has also been the subject of experiment and attempts to immunize a horse are *en train*. A very important factor in the evaluation of immunity is the

dosage of test virus, and much time has been expended on methods for the approximate estimation of the minimal infective dose. A finding that the virus, in the peritoneal exudate of guinea-pigs, will survive storage at 0°C. for eleven days, with little diminution in potency, should find useful application.

The potential danger of large rat populations is an axiom in tropical hygiene, while the material damage by these pests to paddy and to oil palm fruit is almost incalculable. In some areas rats are now attacking the inflorescences of the palms: even on small estates the annual kill of these rodents may number 100,000. The magnitude of such kills is indicative of the immensity of the problem that confronts both health authorities and agricultural interests. It is gratifying to record that the Vegetable Oil Section of the United Planting Association of Malaya is making a contribution towards the cost of a rat virus enquiry to be undertaken by this institute. The difficulties to be faced in this connection are recognized. The precipitation of an epidemic will be no easy matter, and the possible danger to public and animal health by the indiscriminate use of the enteritidis or pasteurella groups is fully realized. But if causation of even a minor epidemic among rats is found possible, it is not improbable that large numbers will migrate back to the jungle, thus affording at any rate some temporary relief. There is a Malayan record of the infection of an infant with *Trypanosoma lewisi*, but the infection disappeared without specific treatment within a week or two. It is not considered that the augmentation of virulence to rats of this trypanosome would endanger human life and, as a first line of approach, an attempt has been made to increase virulence by passage through *X. cheopis*. However, the first attempt was unsuccessful.

The enquiry will take the form of an investigation into naturally occurring diseases of local rats, and of experimental work on the production of epidemics by various means. If time permits, methods for poisoning and other modes of rat destruction will also be considered.

The all important question of nutrition, with its practical bearing on the health of the community, continues to receive attention. In the early days of vitamin research, the investigations of Drs. H. Fraser and A. T. (now Sir Thomas) Stanton on beri-beri at this institute were all to the fore, and deficiency diseases have continued to interest the staff. Dr. I. A. Simpson, who worked for some time on the production of therapeutic rice polishing extracts, has now turned his attention to the question of palm oil. The commodity has a considerable carotene content—considered to be a precursor of vitamin A—and, as there is clinical evidence that many of the local population are on the border of definite deficiency, attempts are being made to popularize the use of palm oil in dietary. As an energy supply, its value is unquestionable and the carotene content should prove a most important adjunct, particularly for children. The investigations now proceeding bear on the effect of refining on carotene content and on methods for the isolation of carotene.

Of recent years the country's milk supply has been increasingly supervised, from the points of view of both bacteriological and chemical standards. It may be said that bovine tuberculosis is almost unknown. But although a few dairies furnish a bacteriologically excellent milk, the smaller vendors market a product which bacteriologically is very impure. The effect of the continuously high temperature on bacterial proliferation is, of course, an adverse factor and chilling and cold storage are outside the economic resources of the small milkman.

Adulteration, especially important from the hygienic standpoint because dilution is often practised with polluted well or drain water, has been kept in check by chemical analysis; but this mode of approach is not without limitation. Much of the local milk is from the buffalo and is thus normally richer in solids, other than milk fat, than that from the cow. But it is impracticable to prescribe separate standards on account of identificational difficulties. After experimentation

over two years, Dr. Simpson has found that the freezing point is of considerable local value for the detection of added water. It may be applied to both cows' and buffaloes' milk, to fresh milk or to milk preserved with the prescribed quantity of formalin solution. The cryoscopic test has now been accepted on several occasions by the local Courts.

An interesting research that has been proceeding for some years is the culturing of the blood clot from specimens received for routine Widal reactions. The correlation, by Dr. D. S. Mankikar, of positive cultures with 'H' and 'O' agglutination results, at various periods after the onset of fever, shows that a negative 'O' agglutination by no means excludes a diagnosis of enteric fever. In nearly 10 per cent of approximately 100 cases 'O' (R.T.) readings were less than 10 units even after the second week of the disease. In these cases, however, the 'H' titres had by then attained a high level.

Towards the end of 1934 we were able to welcome Dr. V. B. Wigglesworth, of the Entomological Department of the London School of Tropical Medicine and Hygiene, who worked in the Entomological Division for a short time. In the year under review we have had an opportunity of working with Dr. J. J. C. Buckley of the same school. Mr. Buckley's work has been directed, in the main, to the identification of the insect vector of a helminth of cattle, but he has also interested himself in local human helminthological problems. In the report for 1929 there was reference to 'Sawah itch', a dermatitis occurring among rice-field workers in certain parts of Negri Sembilan. This condition was reported as probably due to cercarial attack, i.e., of similar ætiology to the 'bather's itch' of the United States and elsewhere. Dr. Buckley has re-investigated the problem and, by mouse infection, has tentatively identified the cercariæ as of *Schistosoma spindalis* which infests the buffalo.

Visits such as these, by highly trained and enthusiastic experts, have a most stimulating effect, and the sojourn of visiting workers should be encouraged in every possible way. It may well be that the future staffing of tropical research institutes will comprise some permanent staff supplemented by a number of visiting workers. This development was possibly envisaged by Sir Thomas Stanton, who, when Director here, secured approval for the appointment of two 'Research Students', the posts to be tenable for two or three years only. Owing to the economic depression these two appointments have now been vacant for several years, but it is most desirable that both should be filled at the earliest opportunity.

Routine examinations continued to be a grievous burden, particularly to the Chemical and Bacteriological Divisions and to the Ipoh Branch Laboratory. Although the latter was created primarily for routine work, it was hoped that some time would be available for research. Dr. H. M. Nevin, the officer in charge, has been able to devote a little time to certain investigations on the bacteriology of water supplies and also on the colloidal paraffin test, but, in view of the fact that he with three assistants have reported on upwards of 20,000 specimens during the year, it has not yet been possible to complete these researches.

[This abstract from the general review of the Director indicates the scope of the research work of this very live institute, but the detailed reports of the various researches should be read in the original, because they give far too much detail for justice to be done them in an abstract.]

ANNUAL REPORT FOR 1935 OF THE BRITISH EMPIRE LEPROSY RELIEF ASSOCIATION

REPORT OF INDIAN COUNCIL

'SINCE 1925, when the Indian Council of the association was inaugurated, its task has been to make known to the people generally the latest results of the scientific investigations into the diagnosis and treatment of

leprosy, and to educate them as to the methods by which the disease may be prevented. Corollaries to these efforts have been provision for more and more intensive research work, preparation and publication of propaganda material, training of doctors in the latest methods of the treatment of leprosy, carrying out surveys of the incidence and endemicity of the disease, of treatment centres and skin clinics, and organization of other cognate activities.

A narration of the details of the activities of the Indian Council during the year 1935 must be preceded by its acknowledgment of the services rendered to it, since its inception, by Dr. E. Muir, who retired from India in April 1935. His devoted work, done with conspicuous ability, has been a great asset to the association, and the governing body have recorded their deep appreciation of the most valuable assistance which he has always given to the association and the great work which he has done to promote anti-leprosy work in this country. Dr. Muir's place has been taken by Dr. John Lowe, of the Leprosy Hospital, Dichpali, an experienced research worker, who has for many years taken a keen interest in the problem of leprosy as it obtains in India.

The outstanding feature of the year is the improvement of the financial position which will be rendered possible by a handsome donation of Rs. 3,13,000 likely to be received from the Indian Red Cross Society for its share of the 1935 Silver Jubilee Fund. This will enable the association fully to recoup the loss of Rs. 11,000 sustained by it through the decreased rate of interest on Government securities in which its funds are invested.

All the 17 provincial and state branches have pursued the anti-leprosy campaign according to local needs and conditions, within the limits of their financial resources. In Bihar and Orissa surveys have been held, dietetic experiments made and a large number of patients treated. In Burma intensive local surveys have revealed twelve times more lepers than were returned in the census of 1931. The villagers in one place adopted a remarkable method of voluntary segregation. Madras is going ahead with its formation of a number of clinics and the formation of local leprosy councils. In Bengal a rural investigation centre was established at Bankura, and a systematic survey of 150 villages was conducted which has clarified the situation with regard to the disease in the district. Some of the results, namely that more than 78 per cent of villages are affected and one in every six families harbours leprosy cases, and that two out of every five cases are infectious, are remarkable. One exceedingly important point has been emphasized by these investigations, namely that young children are particularly susceptible to leprosy infection, and that the majority of those infected in early childhood develop the severe and infectious form of the disease. On the other hand, the majority of those infected in later life develop the less serious non-infectious type of leprosy. Therefore, whatever steps are taken to control leprosy, the chief stress should be laid upon the isolation of infectious cases from young children. Good work has also been done under the auspices of the Mines Board of Health, Asansol (Bengal). A Central Leprosy Board, with 12 divisional branches, has been formed over an area of 250 square miles. Each division maintains a clinic with a trained doctor.

A most important part of the research work carried on during the last year was the use of the 'leprolin' test in studying the various aspects of leprosy. Dr. Muir and Dr. Lowe, who jointly carried this out, assert that the test has thrown light on various rather obscure points in connection with leprosy. They further state that the 'leprolin' test has been found useful in epidemiological studies. For example, the rarity of conjugal infection has often been noted, together with the frequency of infection from adults to children. The 'leprolin' test gives the reason for this, most adults being immune and most children susceptible. This type of work has brought increasing emphasis on the

importance of isolating infectious cases from young children.

Leprolin is being tried in the treatment of leprosy, and in resistant cases with limited lesions it has given promising results. The research work also covered pathological and bacteriological experiments, experimental treatment and clinical and field work.

The propaganda material consisting of leaflets, charts, posters, slides and films has been popular. This and the quarterly journal, *Leprosy in India*, which is now in its seventh year, are playing their parts successfully.

The Indian Council employs a propaganda officer for the purpose of helping the provincial committees to undertake surveys, establish clinics, and of advising generally in the methods of the promotion of an anti-leprosy campaign within their area. This officer has visited the Philippine Islands and Japan to study leprosy work in those countries.

Doctors were trained, as usual, in the two training centres at the School of Tropical Medicine and Hygiene, Calcutta, and at the Leper Home and Hospital, Dichpali (Hyderabad, Deccan). A total of about 900 doctors from all parts of India have so far been trained in these centres, and they have, in turn, trained many hundreds in their own provinces. It is not now difficult to find trained doctors in almost every district in India,

which is a most reassuring feature of the anti-leprosy campaign.

The work of the association is still up against a combination of difficulties which will take many years to overcome. Such remarks as patients discharged 'cured', 'non-infectious', 'disease averted', 'apparently cured', 'decidedly improved', 'complete disappearance', 'symptom-free', are becoming quite common, and when it is remembered that thousands of lepers are now under proper treatment, and that one 'cured' or 'improved' case attracts to the treatment centres more than a hundred lepers, the achievements of the past ten years can be better appreciated.

At the end of 1934, the endowment fund of the Indian Council of the association amounted to Rs. 22,32,760; the income Rs. 1,13,985; and expenditure Rs. 1,12,750.

ANNUAL REPORT OF THE MALARIA ADVISORY BOARD, FEDERATED MALAY STATES, FOR THE YEAR 1935. BY A. NEAVE KINGSBURY, CHAIRMAN

This is a valuable report and might be read with profit by all malaria control officers. Unfortunately its mode of presentation does not lend itself to suitable abstraction.

Correspondence

CONSERVATIVE MANAGEMENT OF BOWELS IN PNEUMONIA

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Of late years there has been some divergence of opinion regarding certain points in the treatment of pneumonia; one school strongly advocates the use of digitalis, alcohol and the practice of controlling fever, while the other one holds quite contrary views. The question of adopting a conservative line in the management of bowels in this disease is also a matter for discussion. By conservative management of bowels is meant that 'evacuations are not produced artificially during the active period of disease—in a routine fashion, but only for special reasons, that is, for reasons other than failure of daily actions'. Some authorities advocate this line of treatment very strongly, for the following reasons:—

1. Artificially-produced actions disturb the patient more than natural ones.
2. They increase fluidity and increase bacterial growth, and excite nervous reflexes which unfavourably affects the cardiovascular system.
3. They may endanger the patient's life from the physical exertion required.
4. They encourage gaseous distension.

Therefore even enemas are not given during the active period—except when the patient is seen in an early stage and has had no motion for 24 hours, but not in patients in the late stage or in a poor condition or for the special conditions, such as tympanites which is not controlled by diet, or for a feeling of fullness of the rectum. An enema is given on the second day after convalescence. Cathartics by mouth are never given.

The above statement seems to be very reasonable both in theory and practice and is gaining ground day by day. It is supported by the fact that beside lowering the general resisting power of the patient, it lowers the temperature which is also undesirable under the modern line of treatment. Moreover, it is also corroborated by the principles of Ayurvedic system of medicine.

Practitioners of Ayurvedic medicine generally adopt this line of treatment, not only in pneumonia but in

almost all cases of continuous fever. They never administer any purgative in the first week, in any case of continuous fever with the argument nearly similar to that given above, and they further state that the artificial evacuations during the active period would, in addition to the above trouble, cause also delirium and greatly encourage the tendency to congestion of lungs and thus jeopardize the life of the patient.

They regard any loose motion during this stage (*i.e.*, from 3rd to 8th day) a grave indication from the point of view of prognosis and call these motions 'kachha mal'.

Recently, I have adopted this line of treatment in a fairly good number of cases and found it to be a very beneficial one from every respect. In some cases the bowels remained unopened for about a week without any untoward effect at the end of which—in some cases—they moved naturally, while in others were moved with glycerine syringe.

My excuse for writing this letter is to show one more point on which the East and West meet and to urge the profession to give a fair trial to the above line of treatment in cases of continuous fever beside pneumonia with due consideration.

Yours, etc.,

SHANKER PRASAD K. SHUKLA,
L.C.P. & S. (Bom.),

Medical Officer in charge,
Chok Dispensary.

WESTERN INDIA STATES
AGENCY.

TREATMENT OF SCORPION STINGS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I shall feel highly obliged if you will please allot some space for publishing the following treatment of scorpion stings which I have found successful. The venom injected by the scorpion sting is rarely fatal, but the severe pain sometimes upsets the whole nervous system and complications, like cedema of lungs have occurred and proved fatal.

There are many drugs used for the treatment of scorpion sting, but the one which I use is as follows:—

Collect various species of scorpions, say about a dozen, and put them in a wide-mouthed stoppered bottle containing 8 ounces of rectified spirit. The bottle is kept closed for eight days after which the fluid is filtered into another bottle and the scorpions are thrown away. Apply the above fluid with a pledget of cotton-wool on the part where the scorpion has stung. The patient gets instantaneous relief.

The fluid is deadly poisonous and should never be applied on the abraded skin. Once I applied it to a living scorpion which immediately became motionless and died.

Yours, etc.,

K. J. PANCHOLY.

D. S. BAWAWALA MEMORIAL
HOSPITAL,
VADIA (KATHIAWAR).

[Note.—The rationale of this treatment is somewhat obscure. A control series treated with rectified spirit only would be necessary to establish the specificity of the method suggested by our correspondent.—EDITOR, I. M. G.]

REACTION AFTER ANTI-CHOLERA INOCULATIONS

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In your issue of April 1936, Dr. Madan Tewari requested to know if late secondary reaction after anti-cholera inoculations had been observed by others. He expressed doubt in regard to the technique of his operations on account of the formation of an abscess, but it is difficult to understand why an abscess should develop all at once, and not come to a head.

During the past eight years I have performed more than 10,000 anti-cholera inoculations although records of reactions have been kept for only three years. In the first five years inoculations were given in two doses of 0.5 c.cm. and 1 c.cm. and the second dose 10 days after the first. Secondary reaction was never detected by this method. For the past three years the full inoculation of 1 c.c. has been in one dose, and reactions, varying in degree as well as time, have been noticed in certain cases only. Reaction may come as early as the sixth or seventh day, but in other cases as late as a fortnight after inoculation. The local reaction is generally very painful, early manifestation being slight itching of the part which gradually swells and becomes turgid. Redness and heat soon develop, with enlargement of the lymphatic glands in the axilla and the swelling of the part may extend to the whole of the extremity. Constitutional disturbance may or may not set in.

I have observed that calcium administered before inoculation minimizes reaction to a certain extent, and massage with fomentation, or ichthyol and belladonna help to reduce it. This year reactions were usually severe and practically every case reacted to a certain extent, necessitating the postponement of operations (1,144 cases were done) for a time. The vaccine was suspected and the matter was reported to the health officer of the municipality.

All vaccine used was supplied by the municipal health department, who in turn were supplied by the Bengal public health laboratory. Care was taken that no turbid sample was used and vaccine was kept on ice.

Yours faithfully,

KUMARES BANERJEE, M.B.
Medical Officer.

THE RELIANCE JUTE MILLS CO., LTD.,
BHATPARA P. O. (24-PARGANAS),
10th July, 1936.

Service Notes

APPOINTMENTS AND TRANSFERS

THE VICEROY AND GOVERNOR-GENERAL has been pleased to make the following appointments on His Excellency's personal staff:—

To be Honorary Surgeons

Colonel J. Taylor, D.S.O., with effect from the 19th April, 1936.

Colonel H. C. Buckley, with effect from the 19th April, 1936.

Colonel A. A. McNeight, with effect from the 19th April, 1936.

Lieutenant-Colonel A. MacD. Dick, C.B.E., with effect from the 19th April, 1936.

Lieutenant-Colonel G. G. Jolly, C.I.E., with effect from the 19th April, 1936.

To be Surgeon

Lieutenant-Colonel H. H. Elliot, M.B.E., M.C., Officiating Surgeon to His Excellency the Viceroy, is confirmed in that appointment, with effect from the forenoon of the 4th July, 1936.

Lieutenant-Colonel P. Banerji, on general duty at the Medical College Hospitals, Calcutta, is appointed, until further orders, as Civil Surgeon, Murshidabad, vice Dr. W. A. Browne.

Major K. S. Fitch, Second Resident Medical Officer, Presidency General Hospital, Calcutta, on relief, is appointed as Civil Surgeon, Hooghly, vice Major J. C. Drummond.

The services of Captain J. J. Beausang are placed temporarily at the disposal of the Government of the Punjab, with effect from the forenoon of the 22nd April, 1936.

The services of Captain R. L. Haviland Minchin are placed temporarily at the disposal of the Government of Madras, with effect from the forenoon of the 30th April, 1936.

The services of Captain E. H. Lossing are placed temporarily at the disposal of the Government of Bengal, with effect from the 12th June, 1936.

Captain A. W. West is appointed, on probation for one year, as Deputy Public Health Commissioner with the Government of India, with effect from the 22nd June, 1936.

Indian Medical Service

Lieutenant G. R. C. Palmer is restored to the establishment, 1st May, 1936. The period 17th December, 1935, to the 30th April, 1936 (inclusive), is not to count for purposes of pay, increases of pay, promotion, pension or gratuity. The previous notification, regarding this officer, is cancelled.

The seniority of Lieutenant (on probation) A. C. Taylor is antedated the 1st May, 1935.

PROMOTIONS

The undermentioned officer is granted the local rank of Lieutenant-Colonel, without effect on pay and pension, whilst employed as Director of Health and Prison Services, Orissa.

Major G. Verghese. Dated the 27th April, 1936.

Majors to be Lieutenant-Colonels

Major M. L. Bhargava. Dated 5th June, 1936.
 Major G. A. Hildreth. Dated 11th June, 1936.
 Major T. R. Khanna. Dated 20th June, 1936.
 Major S. Dutt, m.c. Dated 24th June, 1936.

Lieutenants (on probation) to be Captains (on probation)

C. K. Byrnes. Dated 19th March, 1936, with seniority from 1st November, 1935.
 J. A. L. 18th March, 1936, with seniority from 1st November, 1935.
 D. J. P. Parker. Dated 23rd March, 1936, with seniority from 1st November, 1935.
 C. L. Ash. Dated 26th April, 1936, with seniority from 1st November, 1935.
 T. C. M. M. Morrison. Dated 18th March, 1936, with seniority from 1st November, 1935.
 W. M. Niblock. Dated 18th May, 1936, with seniority from 27th December, 1935.
 H. J. Gibson. Dated 12th May, 1936, with seniority from 27th December, 1935.
 S. W. Allinson. Dated 12th May, 1936, with seniority from 13th January, 1936.
 A. W. Sampey. Dated 23rd April, 1936.
 J. Reddy. Dated 23rd April, 1936.
 G. C. Welply. Dated 23rd April, 1936.
 C. L. Greening. Dated 23rd April, 1936.
 C. B. Jones. Dated 23rd April, 1936.
 G. F. Ady Curren. Dated 23rd April, 1936.

LEAVE

Lieutenant-Colonel S. A. McSwiney, Officiating Professor of Obstetrics, Medical College, Calcutta, is granted leave for the period from the 13th October, 1935, to the 17th October, 1936.

The previous notification is hereby cancelled.

Lieutenant-Colonel B. H. Singh, m.c., Civil Surgeon, Burdwan, is granted leave for 4 months, with effect from the 12th May, 1936, or from the date of relief.

RELINQUISHMENT

Captain (now Major) F. M. Collins relinquishes the local rank of Major on ceasing to hold the appointment of Surgeon to His Excellency the Viceroy, 18th July, 1933.

Notes

EULYKOL

Eulykol, a mixture of the phenylethyl esters of a selected fraction of the acids of hydnocarpus oil, is sometimes designated phenylethyl hydnocarpate. In the treatment of lupus vulgaris it has been shown clinically that hydnocarpus esters are effective in quickly clearing up the patches. The lupus nodules slough out and eventually heal up leaving no signs of the nodules.

During investigations carried out at the Wellcome Chemical and Physiological Research Laboratories to discover a preparation less likely to cause pain and local reactions than the creosoted ethyl esters originally employed, it was found that phenylethyl esters were the least irritant and the most readily absorbed. By eliminating the small, uncrystallizable portion of the total fatty acids, it has been possible to prepare phenylethyl esters possessing a minimum irritant action. Eulykol is usually administered by intradermal injection. It is still under trial, but the favourable results so far obtained indicate that it is worthy of more extensive investigations. The advantages of this treat-

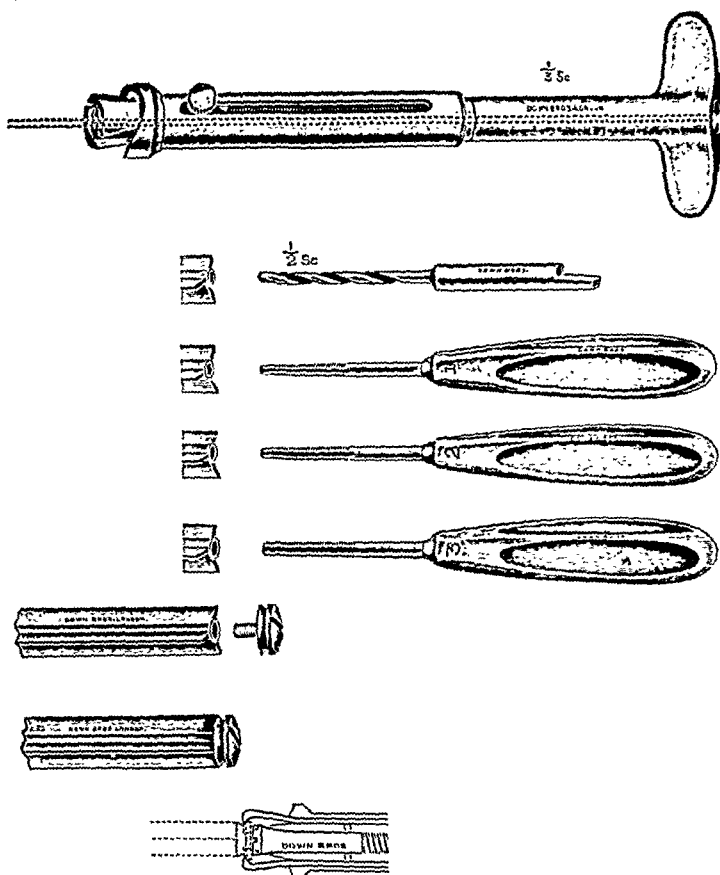
ment are that the course is of short duration, the technique simple and comparatively little pain is experienced by the patient. Further, after treatment very little scarring is present, the skin being quite supple.

This product, originated by Burroughs Wellcome and Co., is available in bottles of 25 c.c.

IMPROVED DESIGN FOR BROOMHEAD'S SMITH-PETERSEN PIN EXTRACTOR

I HAVE found that certain difficulties arise when I use the standard instruments for the Smith-Petersen operation in intracapsular fractures.

Firstly, the Kirschner wire guide for the Sven Johanson pin is apt to bend when the pin is being driven home upon it, making it impossible to extract the wire unless the pin be removed first. The standard Broomhead extractor has no hole in the centre to accommodate the wire and consequently is of no use in such a case.



The modification I have devised is to drill a hole down the centre of the extractor large enough to take the guide, for a Watson-Jones pin.

Secondly, in cases where the bone is very small, and the operator is . . . the maximum length of bone it is easy to drive the pin too far. In one case, in trying to withdraw it a few millimetres I had the misfortune to cut off the head of the pin, the reason for this being that the jaws of Broomhead's extractor slipped beyond the special flange and cut right through the brazed joint between the head and body of the pin. In order to remove this broken pin the following instruments were made for me by Down Bros.

1. A small drill size 00.
2. A tapered tap (thread cutter).
3. A non-tapered tap.
4. A head with a screw to fit the thread, cut in the central canal of the broken pin.

The method of removal was then as follows:

The central canal was first enlarged by the small drill. A screw thread was then cut by means of the tapered tap and after by the non-tapered tap. The new head was then screwed into the pin and the whole withdrawn in the usual way.

To prevent such an accident occurring again, in the new modification of Broomhead's extractor, a spacer is put between the jaws so that they automatically grip the pin at the right level.

KENNETH H. PRIDIE, F.R.C.S.

THE ENGLISH QUADRUPLETS

'ALTHOUGH there appears to be no record in this country of quadruplets living for more than a few days, yet the St. Neot's quadruplets are already three months of age, and they show every sign of growing into healthy and useful citizens. It might be imagined that the survival of quintuplets in Canada is a more remarkable feat to be placed to the credit of modern science. But as a matter of fact that is not the case. The Canadian quintuplets are all girls, and girls are notoriously far more healthy than boys in infancy. Three of the quadruplets of St. Neot's are boys and there is no record in the archives of any country of the survival of quadruplets when three of them were boys, although we believe that there have been previous accounts of the survival of quintuplets which were all females. When there are four children at a birth, all of whom survive, it is inevitable that artificial feeding must be employed, and the quadruplets of St. Neot's have naturally been placed on artificial food. The food chosen is Cow and Gate. Every drop of milk in Cow and Gate Milk Food is derived from the finest pastures of England's West Country, pastures which are rich, not only in minerals, but in the natural vitamin D which makes the assimilation of those minerals possible. In short this English baby food has done something that science has never been able to do before. It has kept alive, and is now bringing up to healthy childhood, four babies born at a birth, three of whom are boys'.—*The Medical Officer*, 20th February, 1936.

MALNUTRITION IN CHILDREN

MR. A. E. CANNEY, Managing Director, at the recent Annual General Meeting of Virol Limited, said the results of the Food Investigations published last year in *The Medical Officer* opened up a very promising line of enquiry into the problem of malnutrition and the best method of combating it. It would be remembered that a number of children attending welfare centres were given as supplement to their normal diet, either virol, cod-liver oil, or halibut-liver oil and milk, and that the growth rate of the children when receiving virol was found to be more than double that attained on either of the other two supplements, which had been selected because they had become almost standard preparations for specialized vitamin treatment. The extremely important conclusions reached showed that further research on a still wider scale would be of great value, and this was indeed suggested in one of the leading medical journals. Experiments which might be regarded as an extension of last year's work had therefore been begun and were still in progress. While it would be premature to attempt any account of these investigations, he was informed that the almost ideal growth rate achieved last year by the children receiving virol had been maintained in experiments covering a much longer period and a much larger number of children.

This confirmed the theory that the malnutrition was not due to any specific vitamin deficiency, nor to an insufficiency of food supply, but to a general lack of balance in the diet resulting in a deficiency in mineral salts and various other factors.

An encouraging result of this work had been the considerable increase in the use of virol by public health authorities and in the great number of hospitals,

sanatoria, and clinics to which our preparation is regularly supplied.

HEAT WITH MEDICATION

WHERE long-retained heat, as well as capillary-stimulating medication, is an essential phase of therapy, frequently a cataplasm is the best means of application.

In antiphlogistine the makers have obtained the maximum of hygroscopic effects, combined with stimulating, yet soothing, medication. The resulting cataplasm expands the capillary bed, withdraws toxic fluids from the parts and stimulates cellular activity. At the same time it affords the patient increased comfort.

THE CHELTINE FOODS CO.

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Original Articles

A BIOLOGICAL METHOD FOR THE CONTROL OF DRACONTIASIS*

By V. N. MOORTHY, B.Sc., M.B., B.S., D.P.H., D.T.M.
and

W. C. SWEET, M.D., D.P.H.

IN two earlier articles (Moorthy, 1932 and 1932a) reference was made to the probable usefulness, of certain species of fish in the control of dracontiasis, due to their habit of feeding on cyclops and guinea-worm embryos. This biological method has been in use in the Chitaldrug district of the Mysore State since 1931 and this report covers observations on its utility as a practical field measure for the control of guinea-worm disease.

A survey of the Chitaldrug district made in 1929 showed that about 250 out of 1,400 villages depended entirely on step-wells for their water supply and that 112 of these villages had dracontiasis to a greater or lesser degree. In 1935 only 25 villages showed cases of this disease. Some of this decrease was undoubtedly due to other causes but the methods adopted for control were the following:

1. Certain of the step-wells were converted into draw-wells by enclosing them with a parapet wall after providing a platform from which water could be drawn.
2. Provision in villages of new draw-wells.
3. Fortnightly treatment of step-wells with lime, perchloron or copper sulphate during the transmission season, from December to May.
4. Stocking step-wells with species of cyclopedicidal fish.

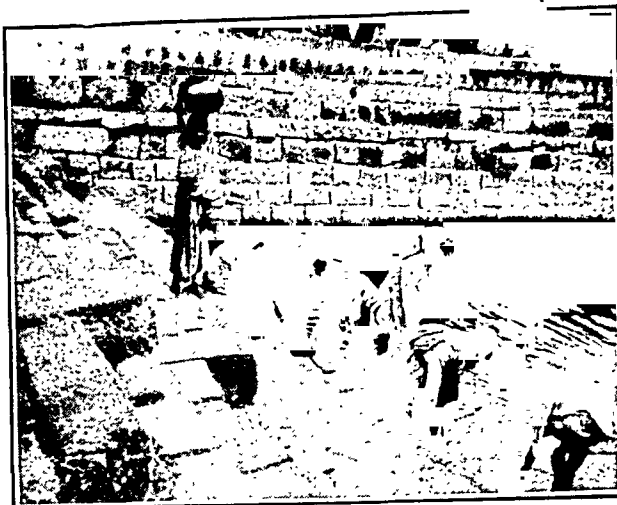
The first two measures mentioned are permanent and result in complete control of guinea-worm disease when they are effectively introduced. No other control methods should be considered as anything but temporary substitutes for these permanent measures. However, the conversion of step-wells and the provision of draw-wells are expensive and sometimes ineffective due to village prejudice and to the quality of water supplied by the new well.

The chemical treatment of step-wells is temporary in its effects (Moorthy, 1932a), and expensive in chemicals and staff, while the use of certain species of fish has been found to be effective, cheap, more permanent, and frequently popular with villagers.

*The work here reported was begun by the Mysore State Department of Health and continued with the support and under the auspices of the Department of Health, Government of Mysore, and the International Health Division of the Rockefeller Foundation.

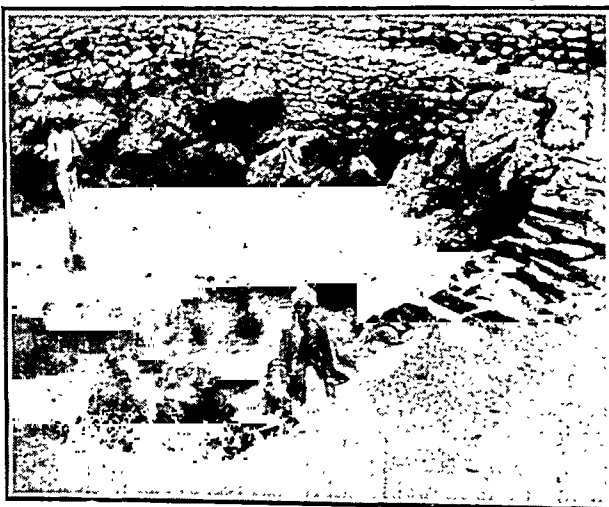
Early field and laboratory observations

During early field studies in the Chitaldrug district certain observations were made which led directly to the trial of fish as a control method. The village of Kelgote, discussed later, gave a demonstration of the usefulness



Step-well A, Kelgote.

of fish, as did four other villages in which dracontiasis had disappeared following floods which had stocked the step-wells with small species of fish. In another village the drying up of one step-well with the consequent use for eight years of another well, naturally stocked with fish, led to the disappearance of guinea-worm disease until the original step-well was



Step-well A2, Medikerepura.

again put into use. It was also observed that no village in which the step-well contained these small species of fish had dracontiasis and that the density per dip of copepods in these wells was much lower than in wells with no such fish.

From specimens of fish collected in step-wells of the Chitaldrug district, Dr. S. L. Hora of

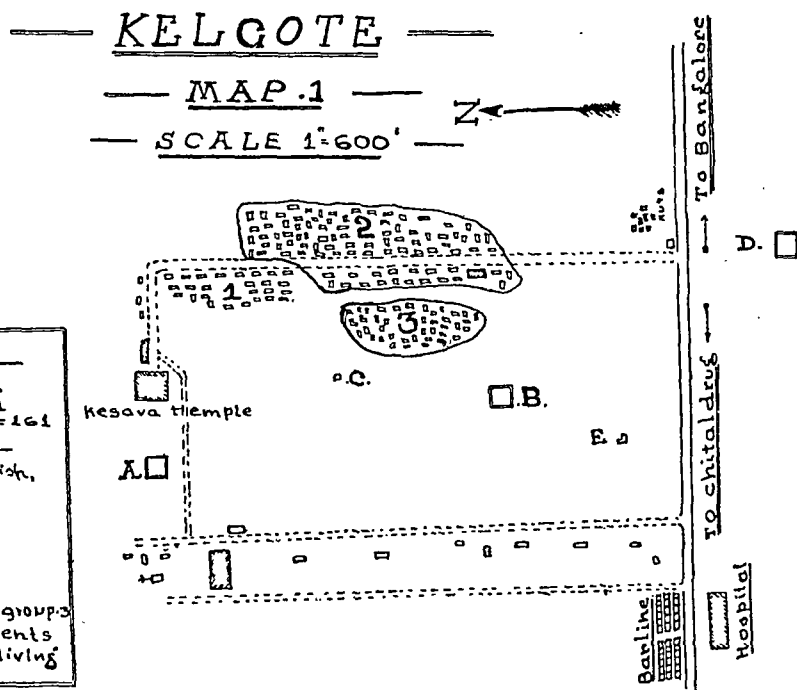
the Indian Museum identified 16 different species (Hora, 1936). The following six species were found to be of use in guinea-worm control :

1. *Barbus (Puntius) puckelli*.
2. *Barbus (Puntius) ticto*.
3. *Lepidocephalocythys thermalis*.
4. *Rasbora doniconius*.
5. *Barbus sophore*.
6. *Barbus chola*.

To these fish have since been added a species of *Gambusia*, imported from Italy, which has also been found useful. All of these species of fish feed on such copepods as cyclops, daphnia, cypris, and diaptomus, both under laboratory and field conditions, although *B. puckelli* and *B. ticto* are the most active in this respect. The *Barbus* species, *L. thermalis*, and *Gambusia*

Any species of fish to be useful in dracon-tiasis control should feed on and digest copepods, especially cyclops, should be a prolific breeder, and should have its breeding season just before or coincident with the guinea-worm transmission season. The use of one species of bottom feeder is apparently an advantage. No reliable information is available as to the distribution in India of the species of fish already mentioned but it is quite possible that other species in other parts of India would fulfil these requirements.

The method of counting cyclops and other copepods in water should be described. Collections are made with a linen tow net ending in a glass tube. The net has a rod six feet in length and the same net is used for all counts. From 100 to 150 dips are taken in various parts of the well and the copepods collected in the



also feed on guinea-worm embryos under laboratory conditions although these embryos emerge weakened but alive in the faeces of all except *puckelli*. *L. thermalis* is a bottom feeder and commonly lies buried in the mud so that its intestinal contents contain many early forms of copepods and various types of ova; it is possibly most useful in destroying the ova and early forms of cyclops. *Gambusia* used alone for control allows wide variations in the density of copepods, depending on the presence or absence of young fish, but is especially effective as a species in lowering the density of diaptomus. The use of all these species of fish together makes an ideal combination and with their presence in a step-well the density of all copepods, including cyclops, remains very low.

glass tube are separated visually by pipettes into three clean bottles labelled 'cyclops', 'diaptomus', 'others'. The copepods are then killed with formalin and later counted under a microscope in the laboratory. The average number per dip can then be calculated.

Kelgote village (map 1)

Kelgote, with a population of 608, can be divided into three groups according to the source of water used. One end of the village, 86 people, used water from step-well A, which contained most of the species of small fish mentioned before; these had been naturally introduced and there were histories of only sporadic cases of guinea-worm infection amongst this group. The second division, 361 people, used water from step-well B, containing

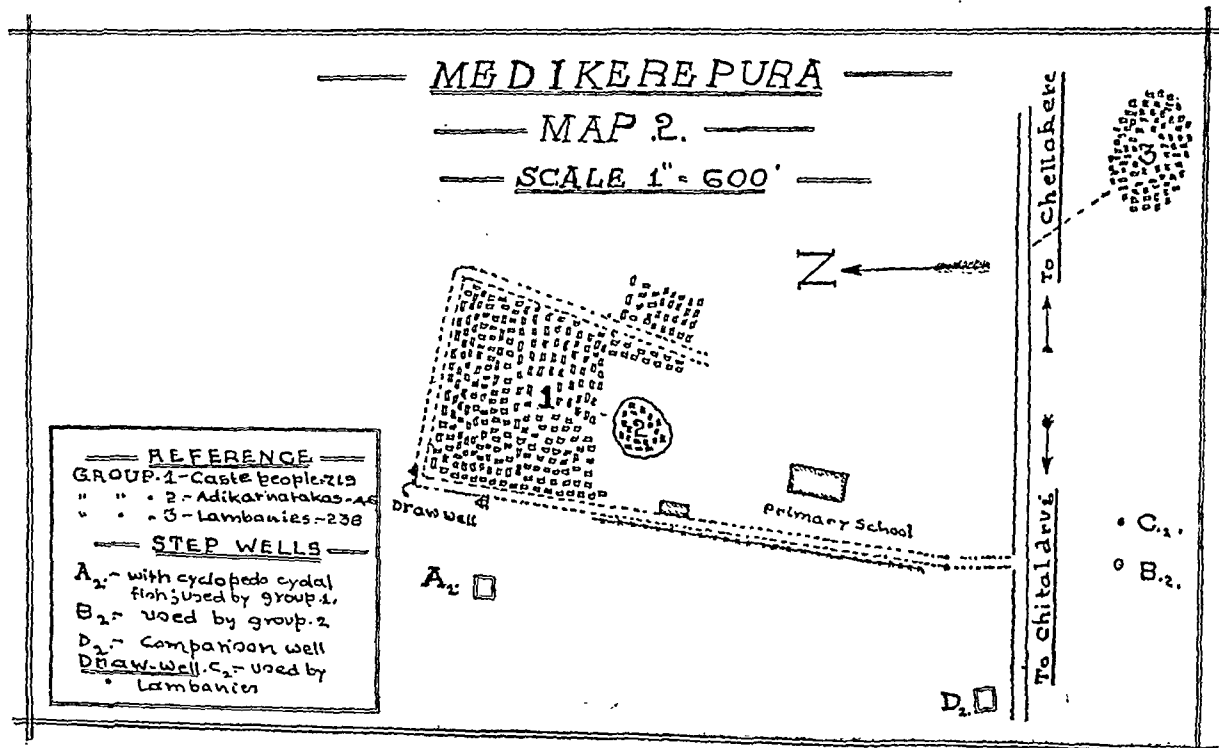
no fish, and histories indicated an average annual occurrence of 46 dracontiasis cases, while the 161 *adikarnatakas* had no history of infection and used water from draw-well C.

After thorough treatment with copper sulphate and perchloron, specimens of each species of fish present in well A were transferred to well B on 30th May, 1931, and careful counts of copepods from B and from a comparison step-well D were kept in following years. Step-well D contained no fish and the water was not used for drinking. The fish in well B multiplied rapidly and since early 1932 the number of cyclops per dip has never exceeded 10; the water of well D has continued to yield from 680 to 1,200 cyclops per dip.

Among the people using water from step-well B there were 22 cases of dracontiasis in 1932,

use water from a draw-well, C₂, within 30 yards of B₂, and are completely free from this infection. Another step-well, D₂, was used for comparative purposes.

The step-well A₂ was thoroughly treated with perchloron on 3rd February, 1934, and was stocked with 100 specimens each of *B. puckerli*, *B. ticto*, *B. chola*, *B. sophore* and *L. thermalis* on the 26th February. Step-wells B₂ and D₂ received no chemical treatment nor were fish introduced. The initial cyclops count of well A₂ was 560 per dip, a count which was reduced to zero four days after the perchloron treatment and had been restored to 28 per dip on the day the fish were introduced. Large numbers of young fish were first seen on 18th June, 1934, when the cyclops count was 87 per dip. On 25th March, 1935,



4 cases in 1933 and no cases since (up to June 1936). This occurred in spite of the presence in a hut (E, map 1), near the step-well, in 1935 of two guinea-worm cases from Bellary who were seen actually infecting the water with embryos during the transmission season.

Medikerepura village (map 2)

Medikerepura village has a population of 1,003 persons, made up of 719 caste people, 46 *adikarnatakas*, and 238 *lumbanys*. The majority of the caste people use water from step-well A₂, since the water of their draw-well is brackish, and their history indicated an annual average of 113 cases of dracontiasis. The *adikarnatakas* use water from a shallow step-well in the fields, B₂, and gave a history of about 22 cases per year, while the *lumbanys*

the count was 10 cyclops in 50 dips and since then there has been some variation but no count has been above 18 per dip. Counts in B₂, the *adikarnataka* well, have never been below 240 cyclops per dip and in C₂ never below 428.

Against the average of 113 cases of dracontiasis among the 719 caste people there were eight cases in 1935 and no cases at all in 1936. Amongst the 86 *adikarnatakas*, whose step-well was not treated in any way, there were 14 cases in 1935 and 18 cases in early 1936, as compared with the annual average of 22 cases previous to 1934. The *adikarnataka* step-well was stocked with fish in June 1936.

The very marked reduction of infection in this village one year after the introduction of fish and its complete disappearance thereafter were probably due to the fact that the fish

were introduced early in the guinea-worm transmission period and just at the breeding season of *B. puckelli*. Neither of the conditions was true in Kelgote village where the initial reduction was not so marked and cases occurred in the second year.

Routine control measures

Since 1934 fish have been introduced into step-wells in 35 infected villages with the result, where careful records have been kept, that guinea-worm disease has disappeared in six and been markedly reduced in four. In certain of these villages the fish have not survived and this difficulty will undoubtedly be met with occasionally in other areas where this method is tried. Investigation has shown that this may be due to the bailing out of water to remove silt, to the drying up of the well in summer, to unexpected treatment with perchloron or overdoses of potassium permanganate, or to the catching of the fish for eating when the water is low. It is also probably true that certain waters on account of their chemical or biological peculiarities will not support these fish.

The first measure in routine control of guinea-worm disease by fish is the establishment of hatcheries from which the various species will be always available. In the Chitaldrug district this has been done in 73 *taluk* and *hobli* headquarters. It should also be noted that each successfully-controlled step-well can become a hatchery for the supply of fish to neighbouring villages.

Any step-well to be stocked with fish should be previously treated with perchloron (3 lbs. to 100,000 gallons) until it is free of cyclops. Should this measure result in odour due to decaying organic matter, a small dose of potassium permanganate will remedy matters. The perchloron, if used properly, will kill many of the predaceous species of fish and leave the well free for the smaller species used in control. It is best to encourage the villagers to bail out the wells and remove silt before the treatment with perchloron is used.

About 100 specimens of each species of fish used for control should be freed in the well about one month after the dosing with perchloron. The fish may be transported in large cans with mesh tops either by lorry or cart, avoiding shaking as much as is possible.

A small staff of one or more sanitary inspectors, depending on the size of the area to be covered, and the necessary peons should supervise the stocking of wells, check up the breeding and presence of the fish in the wells, and record results of the work. It should be noted that this method can be used not only in infected villages but also in other areas in which the disease occurs sporadically, due to the use of step-wells for a drinking water

(Continued at foot of next column)

GUINEA-WORM INFECTION OF CYCLOPS IN NATURE*

By V. N. MOORTHY, B.Sc., M.B., B.S., D.P.H., D.T.M.,
and

W. C. SWEET, M.D., D.P.H.

DURING the course of field and laboratory studies on guinea-worm infection that have

* The work here reported was begun by the Mysore State Department of Health and continued with the support and under the auspices of the Department of Health, Government of Mysore, and the International Health Division of the Rockefeller Foundation.

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supply to which wandering cases of dracontiasis have access.

The custom of keeping fish in the drinking water supply is apparently widespread in India so that the fish control measures fit in with an existing habit. From our experience it is not difficult to teach the villager the proper species to use and he rapidly becomes an enthusiastic and vigilant co-operator in the control of his own step-well. In this connection, it is of some interest to note that, unlike *Gambusia*, the *Barbus* species used in control of cyclops will cluster around the submerged portions of the body of people using the step-well and pull at hairs and loose epidermis enthusiastically. This habit has been noted by the village people and it is made use of in some areas as a treatment for certain types of skin diseases and ulcers.

The fish control of dracontiasis is more permanent, more efficient and much cheaper than the usual chemical methods of control but it should be again emphasized that the abolition of step-wells is the only permanent and fool-proof measure for the control of this disease.

Summary

The control of dracontiasis by the use of certain small species of fish which ingest cyclops and other copepods is suggested, and the freeing of guinea-worm infection of two villages in the Chitaldrug district of Mysore State is described. Routine methods in use for fish control are mentioned and it is claimed that these methods are more permanent, more efficient and cheaper than the usual chemical methods of control. It must, however, be emphasized that the abolition of step-wells is the only permanent, fool-proof, method of control.

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been carried on in the Chitaldrug district of the Mysore State since 1929, repeated unsuccessful attempts have been made to find naturally-infected cyclops in the step-wells of the area. Until 1935 the laboratory had been opened in March and closed in June, at the time when the largest number of dracontiasis cases were available, and all cyclops surveys had been made during these months. It was, however, possible to keep the laboratory open during the whole year of 1935 and until June 1936. Late in the former year a step-well used by the *adikarnatakas* of Medikerepura (Moorthy and Sweet, 1936) was selected for intensive study and early in 1936 naturally-infected cyclops were found in this well.

Since cyclops must be infected by embryos emerging from the female worm shortly after the skin blister has opened, weekly dipping for cyclops was begun in the Medikerepura well from 18th December, 1935, when the first case of dracontiasis was found in the village. The

Mesocyclops leuckarti Claus.
Mesocyclops hyalinus Rehberg.
Mesocyclops decipiens Kiefer.
Paracyclops fimbriatus Fischer.
Microcyclops karwei Kiefer and Moorthy.

Of these species of cyclops only *M. leuckarti* and *M. hyalinus* were found infected in nature although all of them were susceptible in the laboratory and allowed full development of the guinea-worm larvæ.

The first natural infections of cyclops were found on 9th January, 1936, twenty days after the discovery in the village of the first dracontiasis case of the year and at a time when there were eight active cases. On that date the infection rate of the *M. leuckarti* examined was 4.2 per cent and of *M. hyalinus* was 2.1 per cent. The full findings of natural infections in these two species of cyclops, the only one found infected, are given in table I. The highest infection rate found at any examination was 4.6 per cent on 28th January, 1936.

TABLE I
 Natural guinea-worm infection in cyclops

	<i>Mesocyclops leuckarti</i>			<i>Mesocyclops hyalinus</i>			Both species		
	No. exam.	No. inf.	Per cent	No. exam.	No. inf.	Per cent	No. exam.	No. inf.	Per cent
18th Dec., 1935 ..	282	0	0.0	452	0	0.0	734	0	0.0
23rd " " ..	260	0	0.0	408	0	0.0	668	0	0.0
4th Jan., 1936 ..	180	0	0.0	382	0	0.0	562	0	0.0
9th " " ..	94	4	4.2	334	7	2.1	428	11	2.5
14th " " ..	106	5	4.7	175	4	2.3	281	9	3.2
22nd " " ..	121	6	5.0	339	12	3.5	460	18	3.9
28th " " ..	155	8	5.2	260	11	4.2	415	19	4.6
8th Feb., " ..	146	5	3.4	301	6	2.0	447	11	2.5
24th " " ..	184	4	2.1	200	1	1.0	384	5	1.3
3rd Mar., " ..	162	2	1.2	198	1	0.5	360	3	0.8
10th " " ..	184	0	0.0	230	0	0.0	414	0	0.0

Subsequent examinations were all negative.

TOTAL ..	1,874	34	1.8	3,279	42	1.3	5,153	76	1.5
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step-well concerned is an open pit, about 8 feet in diameter and 18 feet in depth, in the fields about two furlongs from the village. It is not stone-lined but has irregular stone steps to the water-level on one side. The dipper used had a twelve-foot rod to which was attached a linen tow net ending in a glass tube and care was taken to make dips from all parts of the well and at varying depths below the surface of the water.

Specimens of cyclops collected from various step-wells of the Chitaldrug district were identified by Dr. Frederick Kiefer (personal communication) as belonging to four old species and one new one (Kiefer and Moorthy, 1935). Of these *M. leuckarti* and *M. hyalinus* are the most common species.

Although *M. leuckarti* had the higher infection rate there were larger actual numbers of infected *M. hyalinus* in the well due to the preponderance of this species at this time of year. As far as transmission of dracontiasis was concerned *M. hyalinus* was the most active species in this village. In spite of careful search no infected cyclops were found after 10th March, 1936.

The usual village pot of water, holding about two gallons, was found by several examinations to contain on the average two infected cyclops at the height of the infection and in no instance was any naturally-infected cyclops found to have more than one guinea-worm larva.

Infections with guinea-worm larvæ were not found in fully-mature female cyclops bearing

ovisacs but were most common in the younger adult females. The distribution of the infections according to the stage of development of the cyclops, as found among 1,302 mixed specimens of *M. leuckarti* and *M. hyalinus*, is given in table II.

TABLE II

Distribution of natural cyclops infections according to stage of development of the cyclops

Life stage of cyclops	Number examined	Number infected	Per cent
Young adult females	522	23	4.4
Immature males and females.	618	18	2.9
Mature males ..	122	4	3.2
Mature females with ovisacs.	40	0	0.0
All forms ..	1,302	45	3.7

As far as could be determined, the guinea-worm larvæ went through the same developmental changes in the body cavities of naturally-infected cyclops as they do in the case of laboratory infections. The possibility of transmission of dracontiasis by these naturally-infected cyclops was demonstrated by the finding at autopsy in dog no. 28 of 51 immature guinea-worms (Moorthy and Sweet, 1936). This dog was fed with 88 naturally-infected cyclops and died 67 days later.

Summary

After repeated unsuccessful attempts made in earlier years after the first of March, cyclops naturally infected by guinea-worm larvæ were found in a step-well in the Chitaldrug district of Mysore State in January and February 1936, at a time when there were in the village several cases of dracontiasis in the early stages. Although *M. leuckarti* had the higher infection rate, the actual number of *M. hyalinus* infected was greater; this was due to its numerical preponderance. No infections were found in other species of cyclops and none of the infected specimens were fully-mature females bearing ovisacs; all infections were in the younger forms of both sexes. That the naturally-infected cyclops could transmit dracontiasis was demonstrated by the finding of immature guinea-worms at autopsy of a dog which died 67 days after a feeding of 88 naturally-infected cyclops.

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PELLAGRA IN VIZAGAPATAM

By G. DINKER RAU, M.D.

and

T. K. RAMAN, M.D., D.T.M. (Cal.)

(From the Department of Medicine, Medical College and King George Hospital, Vizagapatam)

PELLAGRA is not an uncommon disease in the southern presidency. Lowe reported 40 cases in Dichpalli, Hyderabad (Deccan), in 1931 and Raman reported 4 cases in Guntur in July 1933; the first case observed by him was in September 1930.

The first case seen by the senior author in Vizagapatam was in January 1933, and, subsequent to that, every year one or two cases have been admitted to the King George Hospital with typical signs and symptoms of pellagra. Short notes of some of the cases are given below :

Case 1.—K. R., aged 40 years, Hindu male. Admitted in King George Hospital on the 31st January, 1933, and discharged on the 25th February. The patient was admitted with general anasarca, pleural effusion on the right side, and pigmented patches of the skin over the dorsum of both feet, the extensor aspects of both legs and thighs, and the extensor aspects of the forearms and lower third of the arms, and a circular ring of pigmentation round the neck. His tongue was glossy and atrophic. The nervous system was normal. Plasma proteins were 6.14 per cent, of which albumin was 0.9 per cent, globulin 5 per cent, and fibrinogen 0.2 per cent; blood urea was 29.6 mg. and blood cholesterol 114 mg. Urine was normal.

Case 2.—M., aged 40 years, Mohammedan male convict, seen in April 1933. Symmetrical pigmented patches over the skin of the forearms, on the lower half of the arms, chiefly on the extensor aspects, and on the dorsum of both hands. There were similar patches on the dorsum of both feet, and anterior and extensor aspects of the lower third of both legs, and there was a patch on the posterior aspect of the neck on the right side. Tongue showed glossitis with atrophy. Nervous system was normal. There was a scar on the abdominal wall (gastro-jejunostomy). No further investigations were done in this case.

Case 3.—A., aged 25 years, Hindu male. Pigmented patches over the dorsum of both hands, on the extensor aspects of both forearms and lower third of arms. Similar patches on the dorsum of the feet and extensor aspects of both the legs. Tongue showed slight glossitis and no atrophy. There was diarrhoea present, patient having about 10 to 12 loose motions a day. There were marked mental symptoms, periods of mental dullness alternating with acute maniacal symptoms. Patient was dirty in his habits. No investigations could be done in this case as the relations took the patient away a short time after admission.

Case 4.—D. A., aged 32 years, Hindu male. Admitted on 3rd October, 1933, and discharged on the 11th November. Pigmented patches on the dorsum of both wrists and feet; a marked pigmented patch round the base of the neck; tongue atrophic and showed extensive glossitis; diarrhoea was present. Other systems—normal.

Blood counts: Blood smear showed nothing abnormal. Red cells—3.86 millions, white cells—6,956, hæmoglobin—60 per cent. Differential count: polymorphonuclears—60.5 per cent, lymphocytes—29.1 per cent, mononuclears—7 per cent, eosinophils—3.5 per cent. Van den Bergh reaction: direct delayed—positive, faint; indirect—positive, faint. Urine—normal. Wassermann reaction—negative. Gastric analysis—normal.

Case 5.—V., aged 20 years, Hindu female (plate V, figure 1). Admitted into Dr. Kutumbiah's wards of the

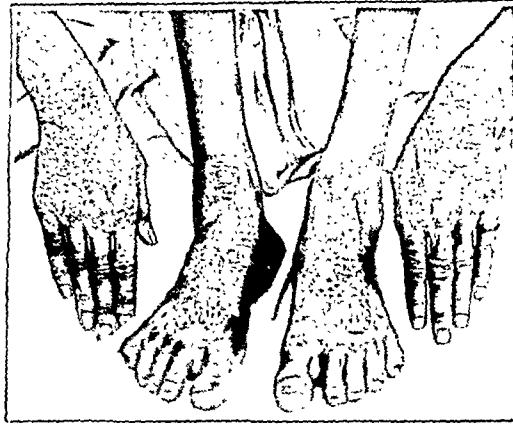


Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

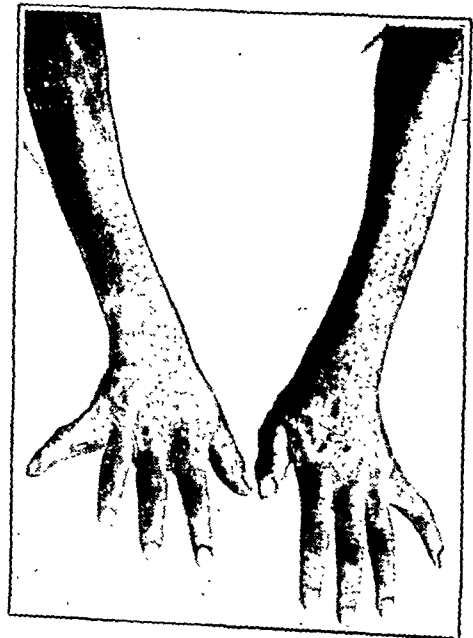


Fig. 5.

Fig. 1.—Case 5 showing the symmetrical patches on the dorsum of both the hands and feet.
 Fig. 2.—Case 6. Patch on the nose.
 Fig. 3.—Case 6. Patch on the forehead and the nose and on the cheeks (symmetrical).
 Fig. 4.—Case 6 showing patches on face and both the hands (symmetrical).
 Fig. 5.—Case 7. Patches on the dorsum of both the hands (symmetrical).

PLATE VI

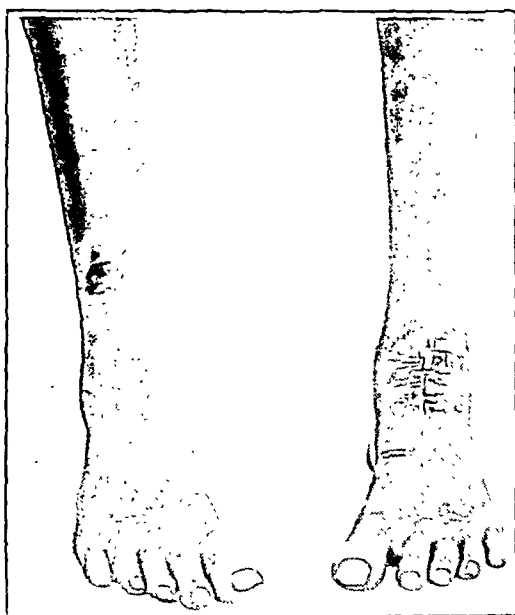


Fig. 6.



Fig. 7.

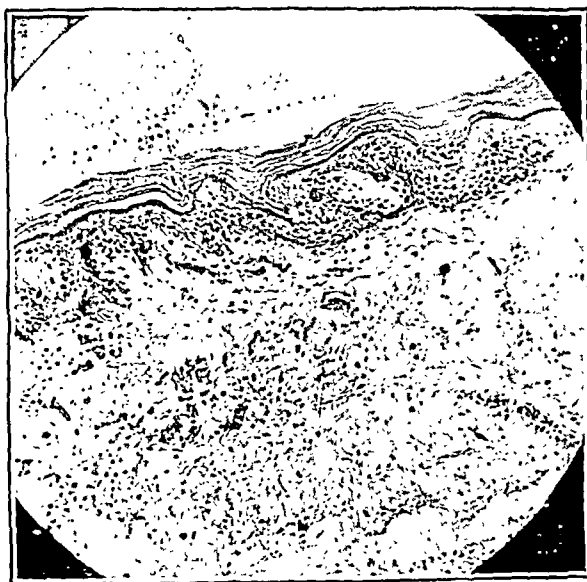


Fig. 8.

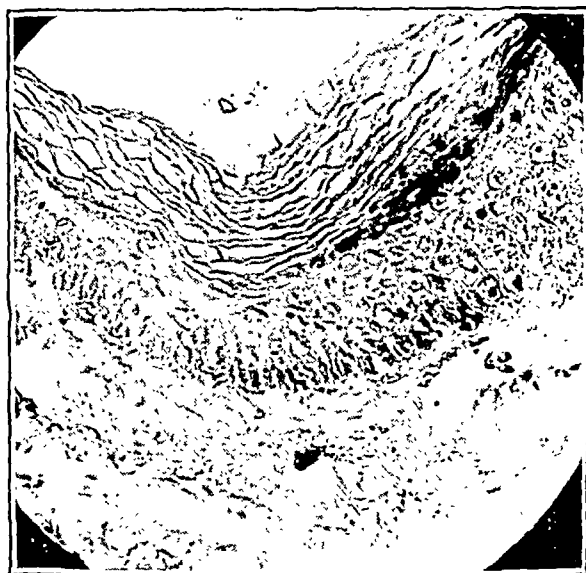


Fig. 9.

Fig. 6.—Case 7. Patches on the dorsum of both the feet (symmetrical).
 Fig. 7.—Case 8 showing the rash on dorsum of both the hands.
 Fig. 8.—Photomicrograph of the skin (low power).
 Fig. 9.—Photomicrograph of the skin (high power)

King George Hospital on the 8th July, 1934. Well-marked pigmented patches on the dorsum of both hands and feet; subjective sensations of heat in the affected areas, anæmia, well-marked glossitis, atrophy of the tongue and mental dullness, no diarrhoea. Other systems—normal. Urine—normal.

Blood: Red cells—1.78 millions, white cells—8,000, hæmoglobin—70 per cent. Differential count: polymorphonuclears—70 per cent, mononuclears—8 per cent, lymphocytes—20 per cent, eosinophils—2 per cent. Blood plasma proteins—5.87 per cent, of which albumin was 2.98 per cent and globulin 2.58 per cent. Calcium—9.46 mg., phosphates—3.46 mg., urea—20 mg.

Case 6.—D. S., aged 20 years. Hindu male (plate V, figures 2, 3 and 4). Admitted on the 3rd December, 1935, for diarrhoea. Tongue atrophic with glossitis; liver slightly enlarged; spleen slightly enlarged. Other systems—normal. Well-marked pigmented patches on the dorsum of the feet and hands, extensor aspects of forearms, on either cheek and over the base of nose. A few patches are seen on the ears.

Blood: Red cells—3.4 millions, white cells—13,750, hæmoglobin—58 per cent. Blood showed microcytic anæmia. Differential count: polymorphonuclears—60 per cent, lymphocytes—30 per cent, mononuclears—1 per cent, eosinophils—9 per cent. Van den Bergh reaction: direct—positive delayed, faint; indirect—positive, faint. Fragility of red cells—hæmolysis began at 0.5 per cent saline and was complete in 0.25 per cent saline. Faeces contained no amœbæ. Blood total proteins—2.03 per cent, albumin—0.94 per cent, globulin—0.89 per cent, gastric function—hypochlorhydria, urine—normal, blood urea—43.1 mg., uric acid—3.49 mg., calcium—10.6 mg., phosphates—3.42 mg., blood sugar—80 mg. per 100 c.c.

Section of skin (plate VI, figures 8 and 9) shows well-marked keratinization of the superficial layers, absence of glossy layer, deficiency of pigment in the pigment-bearing layer, absence of sebaceous glands, and degenerative changes in the hair roots. The dermis shows moderate hyaline fibrosis and no inflammatory infiltration.

A second test meal done on the 20th January, 1936, showed normal gastric acidity.

Case 7.—K., aged 20 years, Hindu male (plate V, figure 5, and plate VI, figure 6). Admitted on 5th December, 1935, for tingling and numbness in the extremities and diarrhoea; slight œdema of the lower extremities; well-marked pigmented patches on the dorsum of the hands and feet and a ring of pigmentation round the neck (Cassel's necklace); anæmia, atrophy of the tongue, and glossitis. Nervous system showed deep reflexes exaggerated, but Babinski was not present. Blood smear shows slight anisocytosis and poikilocytosis. Blood picture—3.86 millions, white cells—7,500, hæmoglobin—60 per cent. Differential count: polymorphonuclears—47 per cent, lymphocytes—45 per cent, eosinophils—7 per cent, mononuclears—5 per cent. Blood Wassermann reaction—doubtful. Gastric function—normal.

Blood urea—50 mg., uric acid—3.6 mg., calcium—9 mg., phosphates—2.89 mg., and sugar—89.7 mg., per 100 c.c. Urine—normal.

Section of skin: Changes are similar to those seen in section of case 6 but the atrophy of the epithelial papillæ is more marked in this case.

Van den Bergh reaction: direct—negative; indirect—positive, faint. Fragility of red cells—hæmolysis begins at 0.5 per cent saline and complete in 0.25 per cent saline.

Case 8.—J. S., aged 40 years (plate VI, figure 7). Admitted on 15th March, 1936. Well-marked pigmented patches on the dorsum of both hands and feet and the extensor aspects of both legs and forearms. The patient complained of indigestion but there was no diarrhoea; no atrophy of the tongue; other systems normal.

Blood picture: Blood smear shows slight anisocytosis and poikilocytosis. Red cells—3 millions, white cells—10,000, hæmoglobin—70 per cent. Differential count:

polymorphonuclears—66 per cent, lymphocytes—18 per cent, mononuclears—7.5 per cent, eosinophils—8.5 per cent. Van den Bergh reaction: direct and indirect—negative. Fragility of red cells—hæmolysis begins at 0.5 per cent saline and is complete in 0.35 per cent saline. Gastric analysis showed nothing abnormal except hypermotility. Serum proteins—5.1 per cent, of which albumin is 3 per cent and globulin is 1.83 per cent. Calcium—11.94 mg., phosphates—5 mg., blood urea—20.2 mg., per 100 c.c. Wassermann reaction—strongly positive.

The chief clinical features of all these cases correspond to the descriptions of pellagra given in the various textbooks. It is only a minority that showed any involvement of the central nervous system. The most characteristic feature of the disease is the pigmentation of the skin. The rash usually appears on the extensor aspects of both the hands and the feet and is symmetrical. The pigmented patches are dry and scaly. The margins are well defined. When the scales are peeled off, they leave a surface paler than normal skin. The appearance of the rash on the extensor aspects, its symmetrical distribution and its circumscribed nature is characteristic of pellagra.

The blood proteins were estimated in four cases. The average plasma protein was 4.8 per cent, of which albumin was 1.95 per cent and globulin 2.58 per cent. Blood cholesterol was not appreciably altered in the only case in which it was investigated. Similarly calcium, phosphates, glucose and urea were within normal limits in the cases in which they were estimated.

Case 5 showed anæmia of the hyperchromic type while cases 6 and 7 showed anæmia of the hypochromic type. Van den Bergh test was done in 4 cases and showed no particular abnormality, except for direct delayed positive faint and indirect faint positive reaction.

Gastric analysis was normal in two cases, while there was hypochlorhydria in case 6, which subsequently became normal.

The faeces contained no parasites in cases where they were microscopically examined.

From this analysis the only abnormality that was more or less consistently found in these cases was a diminution in the plasma proteins particularly of the albumin fraction, with an alteration in their relative proportions.

The causation of pellagra is still a matter of controversy. The chief views held are: that it is due to a dietetic deficiency of biological proteins; that it is due to a deficiency of vitamin G or B₂; and the more recently formulated theory of Castle that pellagra along with sprue and pernicious anæmia is due to a deficiency of the anti-anæmic factor.

The persistent deficiency in the plasma proteins in the cases investigated by us suggests a defect in the protein intake particularly meat, eggs and milk. There is in addition also a certain amount of mineral deficiency as shown by the presence of hypochromic anæmia in two

cases and of the anti-anæmic factor in one case*.

Treatment.—Case 1 was entirely treated with diet which contained milk and eggs and the patient was discharged cured. Cases 2 and 3 were not treated in hospital. Case 4 was treated with a diet rich in proteins and daily injections of a 10 per cent solution of sodium thiosulphate in distilled water intravenously starting with a dose of 5 c.cm. and rising to 10 c.cm. This patient was discharged cured but was admitted again the next year with recurrence of the symptoms. Case 5 was treated with high protein diet and sodium thiosulphate injections but the patient requested to be discharged before any improvement could be noticed. Cases 6 and 7 were treated with diet rich in proteins, sodium thiosulphate injections and liver soup. It is in these two cases that the recovery was most rapid. Case 8 was treated only with a protein-rich diet and liver but without sodium thiosulphate injections. In this case also the recovery was equally rapid and the patient left the hospital cured.

We cannot say how far sodium thiosulphate was responsible in the cure of cases 4, 6 and 7. In all probability, its value was slight as in case 8 recovery was even better without it. The recovery in all these cases seems to support the view that the disease is a deficiency disease due to improper and unbalanced diet defective in proteins leading, in the later stages of the disease, to a deficiency of both mineral elements and anti-anæmic factor.

The authors are fully aware of the meagre details contained in this paper. Its chief purpose is to prove the existence of pellagra in southern India and of the efficacy of a protein-rich diet combined with liver in the cure of the disease.

Our thanks are due to Dr. P. Kutumbiah, for case 5; to Dr. P. Kesavaswamy, L.M.S., radiologist, for the photographs; to Dr. V. K. Narayana Menon and Dr. D. Narayana Rao for the biochemical investigations, and to Dr. P. Ramachandra Rao, for the pathological report of the specimen of the skin.

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A NOTE ON CASES OF TYPHUS FEVER IN BURMA AND THEIR DISTRIBUTION

By G. C. MAITRA

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 and

P. N. SEN GUPTA, M.Sc.

Bacteriological Assistant

COVELL (1936) in an article in the *Indian Journal of Medical Research* gives an excellent review of the literature on typhus fever in India and mentions that the disease was known to be endemic in the trans-Indus districts of Yusufzai and Hazara and in the Himalayan hill tracts, more especially in Kulu Valley, as far back as 1894. Sir Leonard Rogers (1908) in his well-known book *Fevers in the Tropics* gives a small chapter on typhus fever. In this he states 'the annual death rate of 200 and upwards per thousand which used to occur in the insanitary and overcrowded jails of the Punjab even as late as 1878 was attributed and apparently with good reason, in part, to the prevalence of typhus fever by some experienced medical officers'. It is therefore clear that cases of typhus fever in India were suspected on clinical grounds in the neighbourhood of 60 years ago. In comparatively recent years a good deal of interest has been focused on the prevalence of this disease in India since Megaw and his collaborators (1917—28) contributed a series of articles in the *Indian Medical Gazette*.

As a result of this study it has been established that the disease is widely prevalent in India and not particularly confined to certain tracts or localities. The fact that it was not diagnosed for so long was due to lack of precise laboratory tests and inconstancy of clinical manifestations. In recent years gradual development of diagnostic procedures and employment of *Bacillus proteus*, 'X19' and its variants for the Weil-Felix test have marked a step forward in correct diagnosis of typhus fevers.

In Burma when the first case was diagnosed in 1932 by Kundu (1932) at the Rangoon General Hospital on clinical grounds and subsequently confirmed by agglutination test, it was considered that the infection probably was imported from Malaya where it had been recognized earlier and epidemics had occurred in the past. The second case, reported by Martin and Anderson (1933) a year after, contracted the disease at Thayetmyo in Upper Burma while touring in the jungles. A history of insect bite was available and the patient's serum reacted against the 'K' type of proteus 'X19'. Serologically this case was different from the first and came under the group 'scrub typhus' described by Fletcher (1931). The district of Thayetmyo in Upper

Burma where the second case contracted the infection is too far away from Malaya or any important seaports to suggest importation from outside. The logical inference therefore is that the disease was acquired from local sources.

This led us to investigate the prevalence of typhus fever in Burma and incidentally to work out its distribution in the province. About two years ago we started examining all samples of blood sera from cases of prolonged pyrexia by the Widal and Weil-Felix tests, subject to limitations that where medical officers in charge asked for the Widal test alone and after doing this no sera were available for the Weil-Felix test. This difficulty, however, was removed to a great extent by issuing a circular letter through the Inspector-General of Civil Hospitals, Burma, instructing medical officers to send sera in quantities sufficient for both the tests. In this circular the medical officers were also requested to supply information on the following points:—

1. History of insect bites.
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In this way after about two years' continued work 109 cases of typhus fever have been diagnosed which would otherwise be returned clinically as enteric fever or pyrexia of uncertain origin. Serologically the cases mainly reacted against *B. proteus* 'OXK' and 'OX19'. Only a very small number reacted against 'OX2' type. The serological types of positive* cases have been summarized in the table given below:—

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As regards distribution of these cases by localities where the infection was actually acquired, we have not been able to collect very accurate information. Many of the victims were poor ignorant villagers or working class people who migrated from place to place to earn their living and were unable to say where they picked up the infection. However, a summary, prepared according to places or

districts from where the blood samples were received, is given below. From this it is apparent that the disease has a very wide-spread distribution.

Distribution of typhus fever according to districts in Burma

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<i>Lower Burma.—</i>				
Rangoon ..	3	10	1	14
Syriam ..	1	16	..	17
Insein	2	..	2
Henzada ..	11	11	2	24
Prome ..	1	3	..	4
Myaungmya ..	..	2	..	2
Thaon ..	..	2	..	2
Toungoo ..	1	..	..	1
Tavoy ..	..	1	..	1
Bassein ..	1	..	..	1
<i>Upper Burma.—</i>				
Yamethin ..	1	1	..	2
Meiktila ..	4	1	..	5
Kyaukse ..	1	3	..	4
Magwe ..	..	4	..	4
Shwebo ..	3	..	..	3
Chin Hills ..	3	..	..	3
Katha ..	1	2	..	3
Bhamo ..	..	3	..	3
Southern Shan States.	4	3	..	7
Northern Shan States.	2	..	..	2
Mandalay ..	1	..	..	1
Maymyo ..	1	..	..	1
Minbu ..	..	2	..	2
Myitkyina ..	1	..	..	1

On further analysis of cases we were unable to find any strict correlation between serological types and rural or urban areas of origin as had been noted by workers in Malaya who coined the terms 'scrub typhus' and 'shop typhus'. We frequently came across cases occurring in towns reacting against 'K' type of *B. proteus* OX19. Similarly many cases with a history of having picked up the disease in rural areas reacted against *B. proteus* OX19 only.

With regard to three queries we sent round for collecting information, in 97 positive cases no significant information was available, in 4 cases there was a rash only, and in 6 adenitis alone was noticed. In 2 cases both a rash and superficial adenitis were present. In one of the patients of the last category a definite history of leech bite while walking through jungles was obtained. He had copper-coloured rash all over his body with extensive superficial adenitis but no sign of ulceration anywhere, as is seen in tsutsu-gamushi disease. The patient was a European and became seriously ill. His blood

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(Continued at foot of next page)

CHANGES IN CERTAIN CHEMICAL CONSTITUENTS OF THE BLOOD IN KALA-AZAR

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THERE are several diseases in which one or more of the chemical constituents of the blood in the affected person show characteristic alterations. These alterations are most pronounced towards the later stages of the disease and they disappear when treatment and cure of the disease take place. Take blood cholesterol, for example; it has not only been shown that it is markedly decreased in advanced cases of cancer, pernicious anæmia, tuberculosis, typhoid fever, malaria and blackwater fever, but also that it returns to normal during recovery and after complete cure. It is not definitely known what the significance of this

(Continued from previous page)

reacted against *B. proteus* OX19 'K' strain to a titre of 1 in 1,500.

Summary

1. One hundred and nine cases of 'typhus fever' were discovered in Burma in the past two and a half years by the Weil-Felix test against *B. proteus* OX19 and its variants. In the absence of a serological test, most of these cases would have been diagnosed as enteric fever or pyrexia of uncertain origin.

2. Typhus fever is widely distributed all over Burma and cases have so far been found in 24 out of 40 districts in the province.

3. Cases of 'scrub typhus' and 'shop typhus' appear to occur indiscriminately in rural and urban areas.

Our thanks are due to Lieut.-Colonel L. A. P. Anderson, I.M.S., the past Director of the Pasteur Institute, Rangoon, who initiated the present investigation.

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change is, but it is generally supposed that it may be associated with the anæmia, cell proliferation, phagocytosis, or hæmolysis noticed in the course of these diseases.

In a recent paper on the cholesterol changes in monkey malaria, we (Krishnan, Ghosh and Bose, 1936) brought forward evidence to show that a condition of hypocholesterinæmia is produced as a result of severe malaria and that immediately following treatment a rise in cholesterol to normal occurs. In tuberculous monkeys we found (Krishnan, 1936) a marked fall in the cholesterol level, specially in severe cases of acute miliary tuberculosis. In order to test whether similar changes occur in kala-azar we undertook the present study. We included in the study glucose and phosphorus estimations as well.

The kala-azar cases studied were those admitted to the kala-azar wards of the Carmichael Hospital for Tropical Diseases, Calcutta, under Dr. L. E. Napier. Samples of blood were taken from the cases before, during, and after treatment, and all estimations were done on the whole blood. Cholesterol was estimated as total, free, and ester, and phosphorus as inorganic and organic phosphorus. The techniques used for the estimations are those recommended by Bloor, *i.e.*, for total cholesterol—the method of Bloor, Pelkan and Allen, 1922; for free cholesterol—the method of Okey, 1929, and Turner, 1931; for glucose—the method of Benedict, 1931; for inorganic phosphorus—the method of Tisdall, 1922, Embden, 1921, Fetter, 1923; for organic phosphorus—the method of Whitehorn, 1924.

The cases investigated were classified into the following four groups—(1) advanced kala-azar cases, (2) moderate kala-azar cases, (3) early kala-azar cases, and (4) non-kala-azar cases. Under (1) were included all cases of kala-azar with big spleens and livers, giving a strongly positive aldehyde test and showing parasites in large numbers in liver or spleen puncture smears; under (2) were included kala-azar cases giving a moderate to strongly positive aldehyde and showing fewer parasites, and often giving a history of previous treatment and relapse, and having spleens of variable size; under (3) were included cases of kala-azar with small spleens, giving a weakly positive aldehyde and showing few parasites in liver puncture smears; and under (4) were included non-kala-azar cases showing marked enlargement of the spleen, negative aldehyde and negative liver or spleen puncture smears. These were specially included for purposes of comparison with advanced kala-azar cases.

CHANGES IN TOTAL CHOLESTEROL

Before treatment

In all, 26 samples from 18 kala-azar and 8 non-kala-azar cases were obtained prior to treatment and the following are the results.

The figures represent mg. of total cholesterol in 100 c.cm. of whole blood.

Advanced kala-azar—76, 87, 90, 92, 97, 112, 168, 174. Average—112.

Moderate kala-azar—109, 113, 129, 133, 135, 139, 174, 206. Average—142.

Early kala-azar—140, 160. Average—150.

Average for all kala-azar cases—130 mg.

Non-kala-azar—107, 108, 111, 115, 131, 139, 152, 160. Average—128.

Average for all non-kala-azar cases—128 mg.

It is generally accepted that the range of normality in man for blood cholesterol is from 130 to 190 mg. per cent. Taking this as the standard, it will be seen that the cholesterol content of the blood in the cases studied varied greatly. In the early kala-azar cases there was no change. In the moderate cases 2 out of 8 showed low cholesterol and in the advanced cases 6 out of 8 showed low figures. In the non-kala-azar cases 50 per cent showed similar low values. From these it may be concluded that, in kala-azar with the progress of infection, there is a tendency for total cholesterol to come down. This feature, however, is not peculiar to kala-azar, as non-kala-azar cases with enlargement of spleen also showed a similar fall in cholesterol.

During treatment

In all, 10 samples were examined and the following values in mg. per cent were obtained:—

Advanced kala-azar—105, 123, 143, 144, 147. Average—132.

Moderate kala-azar—105, 116, 270. Average—163.

Early kala-azar—163, 167. Average—165.

Average for all kala-azar cases during treatment—148 mg. per cent.

It will be seen from the above that during treatment there was in most cases a tendency for cholesterol to rise. It was most marked in the cases responding well to treatment and least marked in those not showing improvement.

After cure

In all, 11 samples were examined and the following values in mg. per cent were obtained:—

Advanced kala-azar—98, 107, 145, 178, 195. Average—145.

Moderate kala-azar—122, 132, 178, 225. Average—164.

Early kala-azar—132, 160. Average—146.

The average for all cured kala-azar cases—152 mg. per cent.

It will be seen from the above that after completion of treatment a marked increase was noticed in the majority of cases. The increase was most marked in those in which the spleen

went down rapidly and least in those in which it did not get reduced. In the latter the value was either maintained at the low level throughout or it went up a little and came down again at the end of treatment.

Changes in free and ester cholesterol

The variations in free and ester cholesterol in kala-azar and non-kala-azar (before, during and after treatment) are given below; the values are absolute.

FREE CHOLESTEROL

In kala-azar cases

Before treatment—19, 33, 33, 48, 48, 55, 56, 58, 65, 75, 80, 95. Average—55.

During treatment—11, 32, 48, 58, 63, 70, 72, 82, 85. Average—58.

After treatment—18, 22, 27, 35, 55, 57, 58, 66, 68, 75. Average—48.

In non-kala-azar cases

Untreated—27, 52, 63, 65, 72. Average—56.

ESTER CHOLESTEROL

In kala-azar cases

Before treatment—28, 34, 41, 49, 53, 59, 65, 75, 76, 93, 118, 151. Average—70.

During treatment—23, 33, 38, 68, 74, 109, 131, 132, 207. Average—91.

After treatment—57, 68, 75, 85, 88, 104, 110, 151, 160, 170. Average—107.

In non-kala-azar cases

Untreated—55, 67, 89, 105. Average—89.

From the above it will be seen that the rise in total cholesterol associated with treatment and cure is due chiefly to rise in ester cholesterol, while the free cholesterol shows little or no change (if any, a slight fall). Ester cholesterol rises by about 50 to 100 per cent and the ratio which previously had been upset is brought back to normal after cure.

Changes in glucose

In all, 13 samples from the above patients were examined prior to treatment and the following values in mg. per cent were obtained:—

66, 84, 85, 93, 96, 102, 106, 106, 119, 120, 133, 133, 133. Average—108.

During treatment, 9 readings were taken and the following values were obtained:—

75, 86, 112, 118, 129, 132, 139, 149, 148. Average—121.

After cure, 7 observations were made and the values obtained are as follows:—

78, 85, 93, 96, 108, 138, 141. Average—105.

It will be seen that there is a tendency for a slight rise to occur during treatment; whether it is of any significance or not it is difficult to say. Chopra (1927) and Acton and Chopra (1927) have shown that antimony causes increased functional activity of the adrenals.

It is possible that the slight rise in glucose observed during treatment may be due to alterations such as this.

Changes in inorganic phosphorus

Thirteen estimations were made prior to treatment, the values were :—

2.1, 2.1, 2.5, 2.5, 2.7, 3.1, 3.3, 3.7, 4, 5.6, 6, 6.3, 6.5. Average—3.8.

Ten estimations were done during treatment and the values obtained were :—

2, 2.8, 3.2, 4, 4.6, 5, 5.2, 5.3, 6, 8.3. Average—4.6.

Eleven estimations were made after completing the treatment and were :—

2.4, 2.8, 3.1, 3.2, 4.9, 5.5, 5.6, 6.1, 6.3, 6.4, 7.3. Average—4.9.

It will be seen that the variations are not marked or significant.

Changes in organic phosphorus

The phosphorus derivatives in the blood which are extracted by alcohol ether and are commonly termed 'phospholipoids' were estimated before, during and after treatment and the following results were obtained :—

Prior to treatment 15 readings gave the following values :—

5.9, 7.3, 7.6, 8.7, 8.9, 9, 9.1, 9.2, 9.3, 9.3, 9.8, 9.8, 10.8, 11.1, 11.5. Average—8.6.

During treatment 9 readings gave the following values :—

7.9, 8.7, 10, 10.3, 10.5, 11, 11.1, 11.3, 12.7. Average—10.4.

After cure, 12 readings gave the following values :—

7.8, 8.6, 8.9, 9.3, 9.5, 10, 10, 10.2, 10.6, 11.1, 11.5, 11.7. Average—10.

Here, also, no marked variation was noticed in the three stages studied in kala-azar.

It will be seen that the one point of interest brought out by the results presented above is that in the majority of untreated cases of advanced kala-azar blood cholesterol values tend to be low, and that after treatment and cure the value goes up to normal figures. This can be accounted for in two ways—(1) in advanced kala-azar the enlargement of the spleen is chiefly due to an enormous increase in the number of histiocytic elements of the reticulo-endothelial system. It is possible that the hypocholesterinaemia observed is the result of increased storage of this constituent by the reticulo-endothelial cells in the spleen or (2) in advanced kala-azar there is a fairly marked secondary anaemia and the low cholesterol value may be due to the low red cell count. After cure, when the anaemia disappears and the red cell count reaches normal, the cholesterol level also goes up. From a careful study of the cases however there appeared to be a closer parallelism between hypocholesterinaemia

and the size of the spleen than the anaemia. Although the most marked increase in cholesterol after treatment was noticed in those that showed a rapid reduction in the size of the spleen and a marked increase in the red blood cell count, the rise in cholesterol was chiefly due to increase in ester cholesterol. This corroborates to some extent the view that hypocholesterinaemia is associated with the enlarged spleen rather than the anaemia.

Conclusion

Changes in cholesterol, glucose, and phosphorus in the blood of kala-azar cases were investigated.

It was found that in the majority of advanced cases of kala-azar total cholesterol tended to be low. After treatment and cure it rose to normal values. The increase was chiefly due to rise in ester cholesterol; glucose and phosphorus of the blood showed no marked change.

Acknowledgment

We wish to express our thanks to Dr. L. E. Napier, Professor of Tropical Medicine, School of Tropical Medicine, Calcutta, for giving us the permission to take samples of blood from his kala-azar cases and for help in other ways.

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A COMPARATIVE STUDY OF THE MODIFIED KLINE TEST WITH THE WASSERMANN AND KAHN TESTS ON 946 BLOOD SAMPLES

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KLINE's test for the sero-diagnosis of syphilis with defibrinated blood has been modified by Ch'in and Wong (1932). They have used whole blood instead of defibrinated blood and the quantity of blood required for the test has also been reduced, a great advantage in pædiatric practice, while the time taken to perform the test is also much shortened. In addition, 'the use of a special type of glass slide entirely does away with the troublesome preparation and cleansing of the wax rings required in Kline's technique'.

We are indebted to Dr. C. G. Pandit, Officiating Director, King Institute, who attended the Far Eastern Congress of Tropical Medicine, China, for bringing us a sample of the antigen and the special slides for the test as practised by Ch'in and Wong. At his suggestion a quantity of antigen was prepared in the Institute and compared with the sample brought from China in a series of parallel tests with a large number of sera. There was general agreement in the results obtained with the two antigens. The Institute antigen was then used in testing the bloods of nearly one thousand cases who came for treatment to the venereal department of the General Hospital, Madras.

The technique of Ch'in and Wong was followed in all its detail. A very small drop of blood (0.02 c.cm.) is obtained from the patient's finger or lobe of the ear and mixed with a drop of 5 per cent saline in the hollow of the special slide devised by Ch'in and Wong. Then a drop of the antigen emulsion (0.008 c.cm.) is added and the slide is rotated by the hand 200 times. The mixture is then diluted with distilled water to lyse the blood corpuscles and examined under 1/6th objective of the microscope for the presence of clumps.

Results were recorded as minus, plus-minus, one plus and two plus in conformity with the notation recommended by the League of Nations' Health Organization.

1. Absence of clumping was taken as minus, or negative.
2. Slight clumping described by Ch'in and Wong as doubtful was grouped as plus-minus, or doubtful.
3. One plus and two plus (Ch'in and Wong's nomenclature) were grouped together as one plus, or positive.
4. Three plus and four plus (Ch'in and Wong) were grouped together as two plus, or strongly positive.

Blood samples from the same patients withdrawn the same day were also tested by the Kahn and Wassermann tests, the Standard Kahn test and no. IV method of the Wassermann test described in the Medical Research Council Special Reports, respectively, being adopted.

Results

Total number of cases	..	946
Total number of tests	..	946
Clinically recognized syphilitic cases	..	443
Clinically recognized non-syphilitic cases	..	503

A direct comparison of the tests without reference to clinical condition of the patients gives the following results:—

Kline, Kahn and Wassermann agree in	..	73.9 per cent
Kline and Wassermann agree in	..	80.1 "
Kline and Kahn agree in	..	86.8 "
Kline and Wassermann disagree in	..	19.9 "
Kline and Kahn disagree in	..	13.2 "
Kline positive and Wassermann negative in	..	5 "
Kline negative and Wassermann positive in	..	14.9 "
Kline positive and Kahn negative in	..	6.4 "
Kline negative and Kahn positive in	..	6.8 "

The syphilitic cases are grouped into early and late cases. The early cases are those with an infection of less than two years' standing.

TABLE I
Results in early and late syphilis

	ALL TESTS AGREE		KLINE DISAGREES WITH KAHN AND WASSERMANN		KLINE POSITIVE, KAHN AND WASSERMANN NEGATIVE		KLINE NEGATIVE, KAHN AND WASSERMANN POSITIVE	
	Tests	Per cent	Tests	Per cent	Tests	Per cent	Tests	Per cent
Early syphilis ..	161	80.5	25	12.5	5	2.5	20	10.0
Late syphilis ..	170	70.0	40	16.4	11	4.5	29	11.9

TABLE II
Results in the different types of syphilis (Kline and Wassermann)

Type of syphilis	Tests	Kline and Wassermann agree (percentage)	Kline and Wassermann disagree (percentage)	Kline positive (percentage)	Wassermann positive (percentage)	Kline positive, Wassermann negative (percentage)	Kline negative, Wassermann positive (percentage)
Primary syphilis ..	67	77.5	22.5	76.5	87.0	6.0	16.5
Secondary syphilis ..	133	90.8	9.2	88.5	93.0	2.4	6.8
Tertiary syphilis ..	150	85.3	14.7	88.0	93.3	4.7	10.0
Neurosyphilis ..	29	82.8	17.2	79.3	89.7	3.4	13.8
Congenital syphilis ..	6	50.0	50.0	50.0	100.0	..	50.0
Latent syphilis ..	58	81.0	19.0	82.8	91.4	5.2	13.8
Total ..	443	..	..	..	..	..	..
AVERAGE ..	..	77.9	22.1	77.5	92.4	3.6	18.5

TABLE III
Comparison of Kline and Kahn in the different types of syphilis

Type of syphilis	Tests	Kline and Kahn agree (percentage)	Kline and Kahn disagree (percentage)	Kline positive (percentage)	Kahn positive (percentage)	Kline positive, Kahn negative (percentage)	Kline negative, Kahn positive (percentage)
Primary syphilis ..	67	73.2	26.8	76.5	77.5	10.4	16.4
Secondary syphilis ..	133	90.8	9.2	88.5	96.0	0.8	8.4
Tertiary syphilis ..	150	84.0	16.0	88.0	90.7	6.6	9.4
Neurosyphilis ..	29	79.3	20.7	79.3	86.2	6.9	13.8
Congenital syphilis ..	6	50.0	50.0	50.0	100.0	0.0	50.0
Total ..	385	..	..	..	..	..	..
AVERAGE ..	..	76.1	23.9	77.5	90.0	5.3	18.6

TABLE IV
Comparison of Kline and Wassermann tests in cases clinically non-syphilitic

Tests	Kline and Wassermann agree (per cent)	Kline and Wassermann disagree (per cent)	Kline positive (per cent)	Wassermann positive (per cent)	Kline positive, Wassermann negative (per cent)	Kline negative, Wassermann positive (per cent)
503	76.5	23.5	7.8	20.2	5.7	17.8

Comparison of Kline and Kahn tests in cases clinically non-syphilitic

Tests	Kline and Kahn agree (per cent)	Kline and Kahn disagree (per cent)	Kline positive (per cent)	Kahn positive (per cent)	Kline positive, Kahn negative (per cent)	Kline negative, Kahn positive (per cent)
503	90.0	10.0	7.8	3.0	7.4	2.6

Summary of results in the tables

In syphilitic cases—

Agreement between Kline and Wassermann tests is obtained in ..	77.9 per cent
Disagreement in ..	22.1 "
Agreement between Kline and Kahn tests is obtained in ..	76.1 "
Disagreement in ..	23.9 "

The highest percentage of agreement between Kline and Wassermann and between Kline and Kahn occurs in secondary and tertiary syphilis (90.8 per cent in secondary and 85.3 per cent in tertiary; and 90.8 per cent in secondary and 84 per cent in tertiary syphilis respectively).

Reference to table I shows that Kline test disagrees with both Kahn and Wassermann in

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A DROP PIPETTE FOR USE IN THE KAHN TEST

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KAHN has suggested two pipettes for measuring antigen suspension: 1.5 or 1 c.cm. graduated to 0.01 c.cm. for measuring the 0.05 c.cm. quantities and 0.25 c.cm. graduated to 0.0125 for measuring the 0.025 and 0.0125 c.cm. quantities. The measuring of such minute quantities with these pipettes is not difficult when one is testing a few blood samples only. The method has certain disadvantages when a large number of tests has to be carried out. The strain on the eye due to reading of the level of fluid in the pipette is great. The time taken is long, not to mention the difficulty of delivering these minute quantities right down to the bottom of the tubes.

(Continued from previous page)

12.5 per cent of early syphilitic cases and 16.6 per cent in late cases.

In the early syphilis cases Kline is positive and other tests negative in 2.5 per cent and Kline is negative and other tests positive in 10.5 per cent showing that the Kline test is less sensitive. Similarly, in late syphilis Kline is positive in 4.5 per cent and negative in 11.9 per cent.

In non-syphilitic cases agreement between Kline and Kahn is the higher (90 per cent), and that between Kline and Wassermann, lower (76.5 per cent).

Kline agrees with the clinical	
condition of the patients in	84.8 per cent
Kahn agrees in	.. 93.5 "
Wassermann agrees in	.. 86.1 "

As a bedside test the modified Kline's test has its definite uses. It is easily performed in a few minutes. When only a very small quantity of blood is available, as in pædiatric practice, also in cases where the result is required in a short space of time, this test may be usefully adopted. The simplicity of the test, however, is associated with the personal factor in the reading of the results. The doubtful and negative results are not easy to read.

We are indebted to Lieut.-Col. H. E. Shortt, I.M.S., the Director of the Institute, for the valuable help received in the preparation of this paper.

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A simple drop pipette would obviate these difficulties in case a single drop measures exactly 0.0125 c.cm. as the other quantities are simple multiples of this.

With this idea in view we tried an ordinary Wright's pipette with rubber teat, bearing in mind that the quantity of fluid contained in a drop depends on the diameter of the delivering end of the pipette. By a series of trials the correct diameter for the delivering end was obtained. The next improvement thought of was some device to steady and regulate the rate of dropping. Wright's throttle pipette was not found quite satisfactory for this purpose. The simple device of making a sharp bend about an inch above the delivering end of the pipette brought about the desired regulation of the drops.

The advantages claimed for this pipette over the Kahn antigen pipettes are the following:—

1. It is easy to make, in any ordinary laboratory where there are facilities for simple glass blowing.

2. The time taken with this pipette for the distribution of the antigen is considerably reduced.

3. Eye strain in reading the level of the fluid (which is inevitable while using the Kahn antigen pipettes) is altogether avoided as one has only to watch the number of drops put into each tube.

4. There is no necessity to introduce the pipette to the bottom of the tubes while distributing the antigen.

Although this is a simple dropping pipette accuracy is not sacrificed at all. A series of 300 parallel tests was done with the drop pipette and with the Kahn antigen pipettes and it was found that the results were identical. After having thus satisfied ourselves we have adopted this pipette for our routine Kahn tests and about 100,000 tests have been done so far, using this pipette for the distribution of the antigen suspension.

Details of making the pipette

An ordinary glass tubing of the outer diameter 4 to 5 mm. and about 10 to 12 cm. long is drawn to a long tapering end in a Bunsen flame. The tapering end is passed through no. 54 bore of the standard drill and wire gauge (Starret and Co., New York) as far as it will go and a mark made on it with a grease pencil flush with the under surface of the gauge. The tube is then withdrawn and cut with a file at the grease pencil mark so as to obtain a neat cut. The pipette is held in a blow flame about an inch above the tapering end and rotated. When the glass is melted a sharp bend is made as shown in the illustration. The cut end is ground flat on a piece of fine emery

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PROXIMATE ANALYSIS OF A NATIVE BEER PACHWAI OF THE ABORIGINAL TRIBES IN BENGAL

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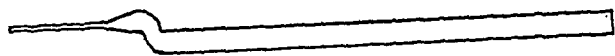
Pachwai is a country-made potable spirit, extensively consumed by the miners and the low class people in the Asansol mining settlement. Recently Chopra and Chopra (1933) have pointed out that it is the universal drink of most of the aboriginal tribes, such as the Sontals and Bhils, which inhabit the Chota Nagpur hills, and that its use has spread all over the province of Bengal. Men, women and children of tender age freely indulge in taking it. It is a very cheap beverage. One can get a pint of spirit for the small sum of two pice. On an average a man will consume about 6 to 8 pints during the day.

It is a very crude wort, ugly to look at. To many it would appear at first glance to be a deadly poison, containing innumerable bacteria, fit to be discarded from a hygienic point of view.

The Asansol mining settlement is the abode of cholera epidemics and there was a time when this *pachwai* was suspected to be one of the gateways of the transmission of cholera. On inspecting several grog shops it was found that the vats in which the boiled rice was kept

(Continued from previous page)

paper. A rubber teat is attached to work the pipette.



Special drop pipette for use in Kahn test.

The calibration was carried out by repeated trials as follows:—

A Wright's pipette with a long tapering end was made. Fifty drops of the antigen emulsion were dropped into a small tube with this pipette and the whole quantity was measured with a measuring pipette. If the quantity was found less than 0.625 c.cm., the tapering end was filed off a little higher to give a bigger drop and then another 50 drops were measured. Thus by a series of trials the correct diameter of the lower end of the pipette was determined which gave 0.625 c.cm. for 50 drops. This diameter was measured with the standard drill and wire gauge and it was found to be no. 54.

When 50 drops measure 0.625 c.cm. one drop from such a pipette measures 0.0125 c.cm. provided the pipette is held vertically and the antigen dropped at a uniform rate of 30 drops per minute. Thus one drop, two drops and four drops will give 0.0125, 0.025 and 0.05 c.cm. respectively.

for fermentation with yeast (locally named *bakhar*) was wholly covered up with swarms of flies and other insects. These are only partially separated by mechanical methods. This has tempted me to study it thoroughly from a hygienic point of view. On enquiry it was learnt that about 90 per cent of miners and general low class people of this mining area take the *pachwai*. In this article an attempt has been made towards the study of the proximate principles of this potable spirit, its bacteriological and microscopical examinations and the viability of different pathogenic bacteria in it.

Preparation.—It is prepared in a most crude and simple manner. Generally about 5 seers of rice are boiled with water for 2 to 3 hours, until an almost dry dough of boiled rice is obtained. This is then packed with the addition of necessary yeast (locally named *bakhar*) in an earthenware vat and kept in a damp and warm place with the mouth of the vessel tightly closed by a lid or cover, where fermentation is allowed to continue for 3 days. After 3 days a large amount of boiling water is added and the dilute watery solution of the spirit is separated from the 'lees' or residue, which consists chiefly of unfermented starch and yeast cells, by means of an iron net which serves the purpose of a strainer, and the filtrate as allowed through the network carries along a large amount of gelatinous boiled rice with the dilute watery mixture of the alcohol which constitutes the *pachwai*.

Physical characteristics.—It has a light yellowish tint. It is distinctly acidic, its pH value being slightly lower than 3. It has a peculiar flavour and contains much dissolved gas which causes it to froth. It exhibits ropiness. The yeast is not completely separated; yeast and many Gram-positive bacteria were detected by the hanging-drop method and staining method (detailed examination is proceeding). Microscopical examination of a loopful of *pachwai* revealed the presence of abundant yeast cells and some Gram-positive bacteria.

The yeast cells have the following characteristics:—Endospores, budding, Gram-positive and gas reaction.

Experimental

Samples of grog from different shops within the Asansol mining settlement have been analysed for:—its alcoholic content, fixed acidity, ash, starch, dextrin and cellulose, proteins, volatile acidity, ester, total solid matter, and suspended matter.

The large amount of gas present which causes it to froth during pipetting, measuring and distilling is got rid of before starting the analysis by the 'tossing method', in which process it is quickly poured from one vessel to another and back again several times, the

solution being thoroughly agitated throughout the process.

Alcohol is estimated by the direct distillation method. 250 c.cm. of the sample are distilled until about 200 c.cm. of the distillate have been collected and made up to the mark with distilled water. Alcohol is estimated from its specific gravity.

Fifty c.c. of the sample are evaporated on a water-bath and dried at 100°C. for total solid matter and 25 c.cm. are filtered, the residue dried at 100°C. and weighed for suspended matter.

Total acidity is determined after by washing 25 c.cm. of it by means of N/10 alkali using phenolphthalein as outside indicator; it is recorded in terms of crystallized tartaric acid per cent. Twenty-five c.cm. of the spirit are then evaporated in a china basin to a volume of 2 to 3 c.cm., hot water is then added and the whole again evaporated down to 3 c.cm. and the process is repeated once more. The solution is then titrated for volatile acidity.

Starch, dextrin and cellulose are estimated by hydrolysis with dilute hydrochloric acid under reflux and the sugar is estimated by Fehling's method.

Ester is estimated by saponification with N/10 alkali. Protein is estimated by Kjeldahl's method.

The figures obtained in connection with analysis of *pachwai* can be compared with those of some typical foreign beers with similar low percentage of alcohol, acidity and proteins.

On enquiry we have learnt on an average a person takes about 2 to 3 litres of *pachwai* during the whole day. Therefore the production of energy or physiological heat units by the proximate principles of *pachwai* in the human organism at rest can be estimated in calories thus:—

In 3 litres average carbohydrates = 30 grammes.

Proteins = 12 grammes.

Production of heat

Metabolism of Large calories.

Proteins (12 grammes) .. $12 \times 4 = 48.0$

Carbohydrates (30 grammes) $30 \times 4.1 = 123.0$

Total 171.0

The food value of 30 grammes of alcohol which is at the same time a stimulant and food adjunct is small. Along with these the important alcoholic solution of yeast is taken which contains the anti-neuritic vitamin B. It is highly probable that the use of yeast along

TABLE I

Number of samples	Alcohol, per cent	Suspended matter at 100°C., per cent	Total solid at 100°C., per cent	Ash, per cent	Starch, dextrin and cellulose, per cent	Proteins, per cent	Volatile acidity, per cent	Fixed acidity, per cent	Esters, per cent
1	4.2	1.32	2.43	0.14	1.12	0.42	0.28	0.024	0.0062
2	3.9	1.56	2.36	0.11	0.88	0.36	0.21	0.022	0.0076
3	4.1	1.21	2.68	0.12	1.01	0.32	0.20	0.012	0.0064
4	4.4	1.36	2.15	0.13	1.21	0.45	0.21	0.010	0.0068
5	4.6	1.57	2.15	0.11	0.94	0.29	0.28	0.024	0.0052
6	4.2	1.09	1.82	0.09	0.86	0.52	0.26	0.021	0.0048
7	4.6	1.24	1.92	0.12	1.21	0.41	0.23	0.016	0.0032

TABLE II

Analysis of some typical beers (Moor and Partridge, 1930)

	Sp. gr. at 15.5	Alcohol, per cent by weight	Extract	Ash	Acidity as acetic acid	Proteins
Bitter ale ..	..	5.4	5.4	..	0.1	0.16
Burton, pale ..	..	5.4	5.1	..	0.1	0.21
Burton, pale ..	1.0106	5.3	5.1	0.3	0.2	..
Scotch, pale ..	..	8.5	10.9	..	..	0.74
Bass's pale ..	1.0138	6.2	7.0	..	0.3	0.58
Lager, American ..	1.0162	2.8	6.0	0.3	0.2	0.45
Lager, Munich ..	1.0110	5.1	5.0	0.2	..	0.83
India, pale ale ..	1.0125	4.3	..	0.25	0.15	..
Irish stout ..	1.0160	4.3	..	0.23	0.17	..
Bock ..	1.0205	4.5	..	0.27	0.12	..
Mild ale ..	1.0101	3.15	..	0.2	0.08	..

with *pachwai* may be one of the predominating factors accounting for the total absence of beriberi or epidemic dropsy in this mining area.

Summary

A perusal of table I will show that this *pachwai* contains only a small percentage of alcohol; in most cases it is below 5 per cent.

By comparing the results of tables I and II it will be seen that the proximate principles of *pachwai* can be aptly compared with those of some typical foreign beers.

Its nutritive values have been established and the production of energy or physiological heat units have been shown to be on an average about 171.0 large calories for 3 litres.

It contains solutions of vitamins belonging to the groups B₁ and B₂ derived from yeasts which promote growth and nutrition and the extensive use of this beverage may be one of the predominating factors of the total absence of beriberi or epidemic dropsy throughout this mining area.

Acknowledgment

I wish to express my thanks to Dr. B. Mukherjee, M.B., D.P.H., Assistant Director of Public Health, Bengal, for his kindly suggesting this work to me and for his keen interest throughout the work.

This work was undertaken while the author was working in the Asansol Mines Board of Health Laboratory, Asansol (Bengal).

[Note.—We publish this paper because we feel that the data may be of value to those interested in the subject. We must, however, protest against the last paragraph of the writer's summary, and the suggestion that it contains. It is well known that yeast is used in the preparation of *pachwai* and also that yeast is a potent source of vitamin-B complex, but nowhere in the paper has the writer reported any experimental work that shows the presence of vitamin B in *pachwai*, in large or even in small quantities.

There is little evidence that beriberi is prevalent anywhere in Bengal or Bihar so that its absence from the mining area is not remarkable.

There is little evidence that vitamin-B deficiency plays any part in the ætiology of epidemic dropsy, so that the freedom of the mining area from epidemic dropsy—if in fact it is free—can scarcely be attributed to the high-vitamin-B content of *pachwai*, which the writer assumes—probably rightly—but has not demonstrated, and the reputed indulgence of the inhabitants of this area in this drink.—Editor, I. M. G.]

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ÆTIOLOGY OF PRIMARY GLAUCOMA*

By B. G. S. ACHARYA, B.A., M.S., F.R.C.S.E., D.O.
Professor of Ophthalmology, University of Lucknow
and

J. N. JASWAL, M.B., B.S., D.O.M.S. (Eng.), P.M.S.
Research Fellow, University of Lucknow

PRIMARY GLAUCOMA is a common disease in India (two per cent of all eye cases) and its ætiology is still unknown, in spite of the fact that much work has been done all over the world to investigate it. The junior writer of this paper was appointed as a research fellow by the University of Lucknow to investigate the ætiology of this disease, with the guidance of the senior writer.

Methods of investigation employed were suggested by the saying that 'glaucoma is a sick eye in a sick body'. Patients were investigated regarding race, age, profession, diet, use of intoxicants, physique, time of the day of the attack of glaucomatous symptoms, the eye first affected, tonometric and blood-pressure readings, pulse rate, erythrocyte sedimentation rate, liver-efficiency test, blood-urea estimation, urea-concentration test, septic foci, and basal metabolism. In order to have control findings, normal healthy individuals of advanced age were also investigated.

We do not propose to give full details of the methods employed, or to give the tables showing the results of all the findings, so only those findings that might throw further light on the ætiology of glaucoma are discussed briefly.

One of us (B. G. S. A.) has maintained for the past many years that primary glaucoma is mostly due to general metabolic disorders, and from time to time he had the basal metabolism rate done and found that it was invariably higher than in normal individuals of advanced ages. Liver-efficiency tests (bromosulphalein) were done, but in no case in the first twelve was any deficiency noted.

Nitrogen metabolism was considered; in almost every case the blood urea was found slightly but definitely increased. The average value in 84 glaucomatous cases was 42.9 milligrammes per 100 c.cm., as compared with the average 34.5 milligrammes in 28 non-glaucomatous patients of advanced ages. In this connection it is worth while noting that blood urea is comparatively lower in the Indian than in the European.

The urea concentration was 2.43 per cent in 34 glaucomatous patients against 2.56 per cent in normal healthy individuals.

Sixty-eight out of 100 patients were non-vegetarians, but, for practical purposes, all Indians should be considered as vegetarians because they take very little meat, and therefore little value is attached to this last finding. The proportion of Mohammedans to Hindus in

* Rearranged by Editor.

667 cases was 5 to 4½, the former being mostly non-vegetarians.

High blood pressure, so extensively blamed for glaucoma, is apparently not responsible for it. The majority of cases (68) had a fairly low blood pressure, while cases with a very high blood pressure have normal intra-ocular pressure. There is no doubt that hæmorrhagic glaucoma has been observed in cases of hypertension, but in these cases the glaucoma should be considered as secondary and not as primary.

The pulse rate is definitely increased in all glaucomatous patients; this points to some toxic condition.

The erythrocyte sedimentation rate is also found to be higher than in normal individuals of past middle age. We can safely rule out syphilis as a causative factor of primary glaucoma.

Glaucoma has been observed here in a fair number of cases of epidemic dropsy that is prevalent in the eastern provinces of India. In such cases, in spite of the fact that there is high tension, the pupils react to light normally; headache is not a prominent symptom. Tonometric and field changes are characteristic of glaucoma. Operative interference is borne badly, as there is a lot of bleeding during operation, both intra-ocular and from the conjunctiva. The association of glaucoma and epidemic dropsy suggests that glaucoma may be due to some toxin.

The right eye was affected first in 61.43 per cent of cases. It is an accepted fact that the right eye is the master eye in a majority of cases; naturally it is used most in accommodation.

All the lens nuclei, 242 in number, taken out of the eyes operated on by the extracapsular method for senile cataracts in our hospital were separated according to the eye from which they came. The average weight of a single right eye nucleus is 0.0909 grammes and that of the left eye 0.0837 grammes. This shows that the enlargement of the lens is more marked in the right eye. This may be a factor in causing symptoms earlier in the right eye. It also suggests that progressive lens enlargement in both the eyes may be the main local cause (supporting Priestley Smith's theory).

The intra-ocular tension in healthy individuals has been taken in over 200 persons; in the majority of cases the tension is higher in the right eye by two to five readings by McLean's tonometer, as compared with the left eye of the same individual. This might also account for the preponderance of the disease first in the right eye.

In some of our cases (six out of 20) it was found that the evening tension was higher than the morning one; this is contrary to the textbook statements. These patients had their

(Continued at foot of next column)

OBSERVATIONS ON THE INTRA-OCULAR PRESSURE IN CATS

By J. N. JASWAL, M.B., B.S., D.O.M.S. (Eng.), P.M.S.
Research Fellow, University of Lucknow

From time to time it has been disputed whether the intra-ocular pressure depends upon the variations of the general arterial blood pressure or not. The present investigation was carried out with a view to collecting accurate data on the subject in furtherance of a study of the ætiology of glaucoma.

Method

Experiments were done on cats. In every case the cat was anaesthetized (Armitage, M'Dowall and Mathur, 1932) with the minimum quantity of ether followed by chloralose 80 milligrammes per kilogramme body-weight being injected intravenously. The eye cannula, combined with the compensatory manometer without the optical arrangement, made on the lines of Sir Stewart Duke-Elder's manometer (1932), was used throughout. The cat was allowed to settle for two hours after the insertion of the cannula into the eye. The variations in the intra-ocular pressure were noted by the movements of the air bubble inside the capillary tube. The variable factors had been:—

(i) the asphyxiated condition produced by allowing the cat to rebreathe its own expired air for two minutes at a time, and

(ii) variations in the body temperature produced by means of the animal electric heater.

The intra-ocular tension was noted first on a number of cats. Variations in the intra-ocular pressure were noted. Then the cats were asphyxiated to increase the arterial blood pressure and again any changes in the intra-ocular pressure were noted. In a few cats in which the temperature experiments were also

(Continued from previous column)

subjective symptoms most marked in the evenings, usually after hard work, heavy meals, or some excitement.

This observation requires further investigation in order to differentiate between the ætiology of these two varieties, the so-called morning and evening glaucoma.

Conclusions

1. Blood-urea and kidney efficiency is deranged slightly.
2. High arterial blood pressure is not a cause of glaucoma.
3. The right eye is first affected because of the bigger lens in this eye.
4. The ætiology of so-called morning and evening glaucomatous symptoms must be different and requires investigation,

done the changes in the intra-ocular pressure were again observed. Heart rate, respiration, size of the pupil, pupillary and conjunctival reflexes, depth of anaesthesia, body temperature and the movements of the air bubble in the capillary tube were noted immediately before and after the asphyxia experiments. Six to seven series of observations were made on each cat in the course of the day.

From previous experiments it has been definitely established that the arterial blood pressure goes up during asphyxiation.

Observations

1. Variations of the intra-ocular pressure during asphyxiation in 48 experiments:—

Intra-ocular pressure did not vary on 20 occasions.
Intra-ocular pressure was raised on 11 occasions.
Intra-ocular pressure was lowered on 17 occasions.

2. Variations in the pulse rate during asphyxiation in 33 experiments:—

Pulse rate did not vary on 8 occasions.
Pulse rate was high on 16 occasions.
Pulse rate was low on 9 occasions.

3. Variations in the respiration rate during asphyxiation in 32 experiments:—

Respiration rate did not vary on 16 occasions.
Respiration rate was high on 11 occasions.
Respiration rate was low on 5 occasions.

4. Relationship of the intra-ocular pressure to the pulse rate:

A. The intra-ocular pressure varied with the pulse rate in 14 observations:—In four it was raised with the increased pulse rate, in four lowered with the fall in pulse rate, and in the remaining six neither intra-ocular pressure nor pulse rate changed.

B. The intra-ocular pressure did not vary with the altered pulse rate in 10 observations.

C. The change in intra-ocular pressure was the reverse of the change in the pulse rate in nine experiments.

5. In majority of the experiments the intra-ocular pressure varied directly with the body temperature.

Conclusions

The number of experiments does not warrant any definite conclusions, but it appears that the appreciable changes in the intra-ocular pressure are independent of the arterial blood pressure, heart beat, and respiration.

The expenses incurred in the investigation have been defrayed by the Lucknow University. I am specially indebted to Dr. S. N. Mathur of the Physiology Department for his help in carrying out the experiments.

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SEDIMENTATION OF RED BLOOD CELLS IN GLAUCOMA AND OTHER OCULAR DISEASES*

By J. N. JASWAL, M.B., B.S., D.O.M.S. (Eng.), P.M.S.

Research Fellow, University of Lucknow

IN all branches of medicine the erythrocyte sedimentation rate (E. S. R.) is being measured in the investigation of the aetiology of certain diseases, and as an indication of the activity of the disease.

As a part of my investigation with the aetiology of primary glaucoma, I did the E. S. R. in a number of eye cases admitted under the care of Prof. B. G. S. Acharya in the King George's Hospital, Lucknow.

Before giving my exact findings, it will not be out of place to describe briefly the nature of the E. S. R. test. Fahraeus showed that the sedimentation is due to the action of hæmagglutinins, the red cells when agglutinated dropping down. Hæmagglutination has been found to depend upon the presence of proteins in the plasma. Thus sedimentation occurs very rapidly in pure fibrinogen, less rapidly with globulin, and very slightly in solutions of albumin. A reduction in the suspension stability of blood is brought about by an increase in the fibrinogen or globulin protein fractions. Breaking down of tissue proteins may therefore account for an increased rate of sedimentation.

The value of the test.—The E. S. R. test is not a special test for any disease, therefore it cannot be in any sense diagnostic. It has been reported that in diseases such as tuberculosis, carcinoma, acute inflammation, and the toxæmias, the rate of sedimentation is increased. We maintain that primary glaucomatous eye is a sick eye in a sick body. It has also been established by us that nitrogenous metabolism is upset in glaucoma. This led us to carry out the E. S. R. test in a number of cases of primary glaucoma and in patients with other diseases.

Method.—The glass tubes used are 100 mm. long with 3.5 mm. internal diameter. 3.8 per cent sodium citrate solution is prepared. 0.2 c.cm. of this solution is taken in a 2 c.cm. syringe. 1.3 c.cm. blood is drawn from a vein of the patient. The whole is mixed thoroughly in the syringe and the glass tube is filled to the top mark of zero. The tube is fixed upright in a rack. After an hour and a half the reading is taken in millimetres of clear serum left at the top. The results are given below:—

Glaucoma cases.—In thirty glaucoma cases the readings were 2, 7, 10, 10, 10, 12, 12, 15, 16, 16, 20, 20, 21, 22, 22, 25, 25, 27, 29, 30, 30, 35, 55, 60, 30, 46, 50, 63, 70 and 73; the last six were cases of epidemic dropsy and the case with a reading of 35 had a +++ Wassermann reaction. The mean of the series was 28.8.

* Rearranged by Editor.

Patients having other ocular diseases.—In 37 cases of senile cataract the readings were—1, 2, 2, 2, 3, 4, 7, 7, 7, 8, 8, 10, 10, 10, 10, 12, 12, 12, 13, 15, 15, 16, 16, 18, 20, 20, 20, 30, 30, 35, 37, 38, 43, 45, 60 and 75. The mean of these is 18.0.

In 18 cases with miscellaneous eye diseases the readings were—3, 4, 4, 4, 5, 6, 7, 7, 9, 15, 20, 20, 25, 25, 30, 35, 37 and 37. The mean of the 55 readings in non-glaucomatous cases was 17.5.

Conclusions.—The normal E. S. R. as reported by other workers is 5 to 10 mm. These figures are worked out from amongst healthy adults. The eye patients who have been investigated were mostly old people. As a rule one should expect a slightly higher E. S. R. in old people. From the findings it is evident that :—

1. The E. S. R. is higher than normal in all the patients.

2. In glaucoma it is 28.8 mm., a comparatively high figure.

3. In cases of glaucoma with epidemic dropsy it is considerably higher.

4. In non-glaucomatous persons with other eye diseases it is 17.5 mm.

5. In cataract patients alone it is 18, i.e., almost the same as in other non-glaucomatous ocular diseases.

Comment.—High E. S. R. in glaucoma supports the view that 'the glaucomatous eye is a sick eye in a sick body', the sickness in the body being due to increased nitrogenous content of the blood.

The expenses incurred in the above investigation have been borne by the Lucknow University, and the paper is published with the kind permission of Mr. B. G. S. Acharya, Professor of Ophthalmology, University of Lucknow.

[*Note.*—If the six cases of epidemic dropsy are excluded, the mean of the 24 readings in the glaucoma series is 22.13 ± 13.32 (standard deviation). In the 37 cases of the senile cataract series, it is 18.24 ± 17.14 . The difference between the means of these two series is obviously far below the significance level.

In a series of control cases, Napier and Henderson (1929), using a similar technique, found the mean E. S. R. in 28 (2 were excluded as being very high and therefore probably not normal persons) cases to be 13.455 ± 7.101 . This figure is not significantly different from that of the senile cataract series in this paper, 18.24 ± 17.14 .

On the other hand, the mean in the six epidemic dropsy cases is 55.33 ± 14.96 , and is very significantly different from either of the other series. Therefore, the only conclusion that can justifiably be arrived at is that, in the cases of epidemic dropsy with glaucoma in which the test was done, the sedimentation rate was significantly increased.—EDITOR, I. M. G.

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A Mirror of Hospital Practice

STRANGULATED HERNIA*

By A. F. W. DA COSTA, F.R.C.S. (Edin.), D.T.M. (Cal.),
L.M.S., V.D.

Civil Surgeon, Bhandara, C. P.

MR. S. N., aged 25 years, tall and well built, farmer by occupation and a man of active habits, was admitted into the hospital on the 12th June, 1935, with great distension and pain in the abdomen; intense pain in the right groin and scrotum with a swelling the size of an orange in this region; hiccough and vomiting.

The history of the present illness was as follows :—

The patient whilst crossing a stream about 8 o'clock in the morning on the 8th June, 1935, stepped on a smooth stone, slipped heavily and instantly experienced an agonizing pain in the right inguinal and scrotal regions. He was removed to his house by his companions where fomentations failed to give relief, so he was taken to the nearest dispensary where the medical officer directed him to the district headquarters hospital. The patient and his relatives did not take the advice of the medical officer, but lingered on till the 12th when he sought my advice.

On examination the case was diagnosed as strangulated inguinal hernia. His pulse was 108; temperature 98.6°F .; respiration short, hurried and 38 per

minute, disturbed by hiccough. The tongue was dry, and coated brown. His constitution, as stated above, was good, but his general state was bad. Two capsules of nembatal were administered, while a high enema produced no result, so he was immediately prepared for operation.

Under spinal anaesthesia the sac, which looked purple, was exposed by the classical Bassini's operation. On opening the sac, a loop of the small intestine about six inches long was found almost black in colour, rigid and covered with lymph. On severing the constriction the dull appearance of the gut continued and there was no sign of peristalsis, although the gut was treated with hot saline. After pouring hot saline over it for about 35 minutes distinct signs of improvement were noticed and, with the exception of a small part of the gut and the corresponding mesentery, the rest had improved considerably and remembering my previous experience, (da Costa, 1935) I returned the loop to the abdomen and completed the operation. No sooner had I done this, than the patient passed some very offensive flatus and a large quantity of loose stinking stool.

He was sent back to the ward and put into a Fowler bed and kept warm with blankets and hot-water bottles. He was given glucose 5 per cent per rectum with a drip-feed till he had had ten pints in the twenty-four hours.

His condition gave anxiety, as his tympanites remained unabated. As I had no pitressin handy and it was not available locally, I used pituitrin four-hourly, with hot turpentine stupes also four-hourly. By mouth he was given plain boiled water for the first 24 hours. On the second day he was still bad and restless though he passed some flatus and faecal fluid. Pituitrin and stupes were continued and glucose-D in water by mouth

* Rearranged by Editor.

was given, and glucose solution and normal saline alternately one pint at a time were given per rectum four times in the 24 hours.

On the third day the tympanites seemed less, so pituitrin and stupes were stopped. On the fourth day he received an injection of milk as a safeguard against any infection as the part was much handled previous to my seeing him. He was given barley water, glucose-D, orange juice, grapes and pomegranates. At the end of a week he was given milk, at first diluted, then pure in addition to fruit juice, and he received a second injection of milk. On the ninth day the stitches were removed. At the end of a fortnight he demanded his normal diet which was given to him and the next day he disappeared from the hospital without anybody's knowledge. I have not seen him since, but I am told he is in perfect health at the time of writing.

Some months after my case, referred to above, was published in your journal, there appeared in *The Practitioner* a similar report by an English surgeon.

In my last article I tendered an apology for breaking the laws and canons of surgery but the present report confirms my original opinion, and it seems that an apparently gangrenous patch of bowel is not always beyond the power of recovery.

My remarks apply to cases in which the bowel appears to be lifeless, but is really not so, and it requires considerable experience to discriminate between really and apparently gangrenous intestine.

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AN UNUSUAL FOREIGN BODY IN THE RECTUM

By K. M. LAL, M.B., B.S.

Medical Officer in charge, Sadr Hospital, Sitapur

A PATIENT, aged 54 years, was brought to the hospital on the morning of 15th March, 1936, with the history that while he was lifting a load of sugar-cane the previous evening his foot accidentally slipped on the pieces of cane lying around and he fell, with the result that a piece of cane entered his anus, got broken and could not be taken out.

There was no history of any bleeding, but the man complained of great discomfort due to the lodgment of the foreign body.

The patient was anaesthetized with chloroform and placed in the lithotomy position. The anal sphincter was dilated and on introducing the gloved index finger to its entire length, some resistance was felt and the lower end of the cane was located. Closed clamp forceps were then introduced and, reaching the lower end of the foreign body, the blades were opened, the body caught and then gently extracted with a little manipulation. The foreign body was coated with faecal matter and measured 8½ inches in length. The patient left the hospital the next day.

Discussion.—The story given by the patient appears doubtful for the following reasons:—

(1) There was no tear or laceration or even an abrasion at the anal orifice or on the buttocks. It was not possible for a foreign body of this size and shape to be lodged so high up without causing considerable damage to a curved canal that is not patent under ordinary circumstances and that has a rugose inner wall.

(2) No blood escaped on dilating the sphincter and the mucous membrane was perfectly normal and not in an inflamed condition. This again showed that the long foreign body had been intentionally manoeuvred in, and perhaps not for the first time as it caused no inflammatory reaction.

(3) The end of the foreign body which first came in contact with the examining finger end was not broken but cleanly cut.

(4) The joints were not rough as they normally should be but were definitely smoothed with the help of a knife and the upper end was also shaped and smoothed.

It seems probable that the man was in the habit of using this cane for purposes of sexual gratification and that when he came to me the instrument had slipped beyond his reach.

(Published with the kind permission of Captain U. Sinha Gupta, B.Sc., M.B., B.S., Civil Surgeon, Sitapur.)

BILATERAL RAYNAUD'S DISEASE TREATED BY DOUBLE PERI-ARTERIAL SYMPATHECTOMY

By RAO SAHEB B. C. VACHHRAJANI, L.M. & S., B.M.S.
Medical Officer in charge, Civil Hospital, Godhra

A MOHAMMEDAN BOY, aged about 18 years, was admitted into this hospital on 9th March, 1936, with severe throbbing pain of about 20 days' duration in the fingers of both hands. Both hands up to the wrists were cold and, on all the fingers, pin-point dark patches of commencing gangrene were noticed. The tip of the right index finger was gangrenous up to the first interphalangeal joint. The gangrene was of the dry variety. The pain was so severe as to prevent sleep at night. The case was diagnosed as bilateral Raynaud's disease. Morning and evening temperatures of the palms, of the bend of elbows and of the axillæ were 96°, 97° and 98°F. respectively till the day of the operation. Glycerine-belladonna-iodine-ichthyol paste was applied and Duplex mixture which was later changed to an alkaline mixture with tincture of hyoscyamus and belladonna was given till 12th March without any benefit. The gangrenous patches were increasing in size; the fingers, the palms and wrists were steadily getting inflamed, red, and extremely painful. It was therefore decided to do a peri-arterial sympathectomy simultaneously on both his brachial arteries at the middle of the arm.

On 13th March, 1936, under anaesthesia both the arms were opened and the peri-arterial sheath round both the brachial arteries was removed very carefully over a length of about an inch and the wounds closed. The temperature record of the palms, bends of the elbows and of the axillæ was 97°, 97°, and 98°F. respectively, on the evening after the operation and onwards and the patient had a restful sleep during the night for the first time for 20 days. The morning after the operation the patient said that except in the right index finger he had no pain anywhere, the redness and dark patches were showing signs of abating and in about a week's time, except in the right index finger, all the patches of gangrene had disappeared, the pain and the swelling had also subsided and the hands looked normal. Unfortunately the right operation wound suppurated and that was the only untoward incident in the case. The boy has increased in weight since the operation and looks quite happy.

It was noticed while operating that the brachial arteries on both sides were much smaller in calibre than the usual; the two veins accompanying them looked bigger than the arteries.

No history of any other illness could be elicited.

My thanks are due to Drs. Susai and Shukle for assisting at the operation.

A NOTE ON TWO LEOPARD BITES*

By I. M. DATTA, L.M.F.

Assistant Medical Officer, Khobang Tea Estate

Two cases injured by one leopard were admitted on 27th February, 1936, with the following injuries:—

Case 1.—Three wounds over the head made by claws, one transversely over the top of the head about 5 inches long, stripping the pericranium; and two others over the left temporal region, one of which was bleeding profusely owing to the injury of the superficial temporal artery.

Case 2.—Two bites over the back of the right shoulder joint and scapula and three wounds made by claws over and in front of the right shoulder joint each about 1½ inches deep.

Under sodium-evipan anaesthesia the wounds were enlarged and thoroughly cleaned, the superficial temporal artery ligatured and other bleeding points thoroughly packed with sterilized gauze.

Both the cases had prophylactic anti-tetanic serum injections and anti-streptococcus serum 10 c.cm. daily for three days. Injuries were thoroughly irrigated daily with the following lotion:—

Acriflavine 1 in 750 ..	.. grs. lxx.
Sodium chloride ..	.. oz. iii.
Electrolytic chlorine ..	.. oz. iii.
Water ..	to pints vi.

Short lengths of fenestrated rubber tubing were inserted into the wounds and kept *in situ* for the first five days and the cavities of the wounds were thoroughly irrigated through the outer openings of the drainage tubes, by injecting the lotion under pressure by means of a glass syringe. Subsequently when sinuses formed, the rubber tubes were replaced by gauze drains and the sinuses were irrigated in the same manner by means of a no. 2 rubber catheter. Thus the pus and sloughs were got rid of daily and the hypertonic saline and the antiseptics exercised their full activity, having direct contact with the injured tissues.

Case 1.—Hæmorrhage from the cut end of the superficial temporal artery started on the third day. It was ligatured again through the skin about 3 inches away from the wound, and the bleeding point was thoroughly packed. A curved needle was introduced into the skin at one side of the artery, carried deeply behind and passed out beyond it. Having established that the pulsation of the artery stopped after raising the needle, ligature was passed and firmly tied over the artery, a strip of tightly-rolled lint intervening between the skin and the knot to exert pressure. After running a temperature for a week the patient made slow but satisfactory progress and was discharged cured on 4th April, 1936.

Case 2.—Sinuses formed, both superficial and deep, from most of the wounds ranging from an inch to six inches in length and all were discharging white creamy pus. One of the sinuses was opened on the seventh day under novocaine anaesthesia. An abscess formed over the supra-clavicular region on the twelfth day, probably due to a non-traceable deep sinus, and was opened on

the sixteenth day under sodium-evipan anaesthesia. The case made satisfactory progress after this operation.

Points of interest

1. Although leopards are abundant in this area, they rarely attack human beings unless wounded, or in self-defence.

2. Usually cases end in death from general sepsis. Sepsis in the second case at one time appeared to be spreading in spite of treatment, but fortunately it cleared up.

3. The good results are due to acriflavine and electrolytic chlorine with hypertonic saline lotion, which was the only antiseptic used.

4. The second patient was anaesthetized twice with sodium evipan within 16 days without any bad effects.

I consider that the addition of electrolytic chlorine to the above lotion as suggested by Dr. Whaley greatly enhanced the action of the acriflavine.

My thanks are due to Dr. W. F. Whaley, M.D., the Chief Medical Officer, Assam Frontier Tea Company, Limited, for his keen interest and his kind permission to publish this note, and I am indebted to Dr. R. K. De, Talap Tea Estate, for his help.

A REMARKABLE MONSTER

By MANORANJAN DAS GUPTA, B.Sc., M.B.

Comilla

THE monster shown in the accompanying photograph has two heads, four upper extremities, four lower extremities, two thoraxes, but a single abdomen, without any external signs of



the genito-urinary system or anus. It had a single placenta and umbilical cord. Apparently it is a uniovular twin, of which the blastoderm has not completely divided.

* Read at the meeting of the Assam Frontier and Budla Beta Medical Society held on 18th April, 1936.

HEREDITY IN ICHTHYOSIS

By B. M. KOTHARI, M.B., B.S.

Windham Hospital, Jodhpur

A CASE of advanced ichthyosis was recently admitted into the Windham Hospital. The family history as far as it could be elicited made it apparent that it was a disease of the males in the family transmitted through the females, the latter being immune.

The patient's elder brother was suffering from the same disease, while his sisters were all free; his father did not suffer from it, nor his grandfather so far as could be ascertained. Both his mother and her sister were unaffected, but the latter's two sons had the disease while her daughters were unaffected. My patient's four maternal uncles (*i.e.*, mother's brothers) all suffered from the same disease throughout life. Unfortunately there was no history obtainable of the earlier generations' health.



The patient was a boy, 12 years old, poorly built and under-nourished. The skin of the whole body was more or less rough and scaly, covered with dirty dark brown scales, more marked on the extensor aspect of the limbs, abdomen, and face, while groins, axillæ, forehead, palms and soles were partially free. The sclera were whiter and paler than normal; the hair on the scalp was thin, atrophied and scanty; the patient appeared to be very anæmic with pulsations in the neck, hæmic murmurs and a flabby protuberant abdomen. There were warty nodules on the back of the wrists and front of the ankles.

The condition was said to have been present since birth. The only abnormality in the boy's history was that he was fond of eating sand and that he practised this habit during his early years. Sweating was

imperceptible. Every summer there was marked amelioration due to the shedding of the scales, while during winter the rough skin used to chap very readily. Laboratory examinations of urine, stools and blood revealed nothing except his marked anæmia.

Treatment is very unsatisfactory; the condition usually persists throughout life. Glycerine with unguentum acid salicylic was prescribed to render the skin soft and remove the scales. Thyroid extract was administered, because some hold that the condition is due to thyroid deficiency, the basal metabolic rate being usually subnormal in such cases. The bowels were very constipated and had to be purged daily. The anæmia was treated with Campolon injections. Calcined magnesia taken orally and applied externally has been reported to be useful, but was not tried in this case as he left hospital. The patient was somewhat relieved by the time he left Jodhpur to return to his home.

I must thank Mr. E. W. Hayward, the Principal Medical Officer, Jodhpur State, for permitting me to publish this report.

A HUGE GOITRE*

By S. KUNDU, M.B.

Assistant Surgeon, Civil Hospital, Mokokchung, Naga Hills

TONGPONGNARO, female, aged 30, of Mangmitong, Naga Hills, was admitted on 12th May, 1936, with the complaints of dropsy, breathlessness on slight exertion, and feeling of suffocation and gasping for breath in the recumbent position; duration, one year. No history of rheumatism and syphilis and cardiac valvular disease. A huge goitre is present.



The patient came from an area where goitre is common. She has had the goitre since infancy. It has gradually increased in size throughout her life. She never had any medical

* Rearranged by Editor.

treatment or advice as until recently she had suffered no disability and on admission to hospital she only sought relief of her dropsy and breathlessness and not for the goitre.

The photograph gives a good idea of the immense size of the growth which is by far the largest I have ever seen although I have seen many thousands of goitres in my experience in the Naga Hills.

AN UNTOWARD SYMPTOM IN A CASE OF SODIUM-EVIPAN ANÆSTHESIA*

By R. K. DE, L.M.F., D.T.M.

Assistant Medical Officer, Talap Tea Estate, Assam
and

M. L. SEN

Assistant Medical Officer, Dangri Tea Estate, Assam

A MAN, aged 40, had multiple sinuses of the right hand including the forearm as a result of a septic wound. He was debilitated and was running an irregular temperature. He had slight ascites (hepatic) and intermittent pulse without any organic heart lesion. No albuminuria and no lung disease. In consideration of the above facts he was considered unfit for chloroform inhalation and sodium evipan was decided on as a safer anæsthetic though hepatic disease was a contra-indication. 3.5 c.cm. of the solution was slowly injected intravenously at the rate of 1 c.cm. per minute, the patient gradually failed to count, yawned and passed into unconsciousness. Another 3.5 c.cm. was injected, making a total of 7 c.cm. After waiting for about 2 minutes the operation was begun. A few incisions were made about 5 minutes after the injection and breathing ceased suddenly but recommenced in about 10 seconds. Again after a few minutes, towards the end of the operation, the same thing happened and this time it caused us anxiety as the apnoea lasted longer than on the former occasion. Fortunately respiration returned before commencement of any method of artificial respiration, except a few taps on the abdomen. The operation was completed in 12 minutes and consciousness began to return in about 40 minutes and was complete in an hour.

The point of interest in this case is that respiration ceased twice during the narcosis.

The manufacturers and most observers claim that nothing serious happens to respiration except slight and temporary depression. Ernst (1933), however, observed in some cases 'tonic rigidity of the whole skeletal musculature lasting a few seconds together with holding of the breath' but this did not occur in this case. Slot and Galley (1934) observed respiratory spasm early in anæsthesia sometimes involving the glottis, and also a few cases with temporary inhibition of respiration. Chellappa (1934) also observed temporary cessation of respiration in one case. But none of their cases died of respiratory failure.

This non-controllable anæsthetic is simple and safe but the possibility of this untoward symptom should be kept in mind in consideration of the fact that we are comparatively ill-equipped to meet this accident in tea-garden

practice. That hepatic disease which is a contra-indication to the use of sodium evipan was to some extent responsible for this phenomenon in this case is probable.

Our thanks are due to Dr. W. F. Whaley, M.D., for his permission to publish this case note.

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REPORT ON A FATAL CASE OF AGRANULOCYTOSIS

By B. M. DAS GUPTA

Acting Professor of Protozoology, Calcutta School of Tropical Medicine

SCHULTZ (1922) was probably the first to draw attention to a condition of severe neutropenia which he termed 'agranulocytosis'. Since then several important observations concerning this condition have been recorded by workers in Europe and America. In most cases the syndrome has appeared in people who have had some illness specially associated with pain, for which they have been in the habit of taking amidopyrine or one of the allied compounds.

As far as I am aware, primary agranulocytosis has not been reported previously from this country.

Report of the case

A. C., male, aged 50 years, merchant, had an attack of fever, presumably malaria, about a year ago. It



Photomicrograph of the blood film showing that all the leucocytes in the field are non-granular mononuclears.

lasted about a week and responded to quinine. For the last three months he has been in indifferent health and during this period had several attacks of membranous ulceration of the throat. He suffered from

*Read at a meeting of the Assam Frontier and Budia Beta Medical Society on 18th April, 1936.

sciatica and used to take novalgin (an amidopyrine derivative).

When I saw him five days before his death he had had fever for about two weeks, ranging between 101°F. to 103°F. His spleen was enlarged (4 inches below the costal margin) and tender, and his liver was palpable.

The blood picture was as follows:—

Red blood cells—4,200,000 per c.mm.

Leucocytes—3,200 per c.mm.

Hæmoglobin—80 per cent.

Differential count.—

Polymorphonuclears—4.5 per cent.

Non-granular mononuclears—95.5 per cent.

Aldehyde test—negative.

Chopra's antimony test (with dilute serum)—doubtful.

Culture for malaria parasites—negative.

Culture for leishmania—negative.

Comment

It is a well-known fact that there is marked neutropenia in kala-azar. According to Napier (1927) the neutrophils may fall as low as 30 per cent of the total leucocytes in an ordinary case, and even to 1 per cent in the worst cases of the diseases in the endemic areas of China, as this worker has personally told the writer.

This case showed 4.5 per cent neutrophils associated with marked leucopenia, fever and enlargement of spleen and liver, but the serological tests and the blood culture made under the most ideal conditions were negative. The above results together with the fact that the patient was accustomed to taking a drug containing amidopyrine, that he was suffering from intractable sore throat, and that the disease ran a rapid course and led to a fatal termination, suggest that the case was one of primary agranulocytosis, although clinically his condition suggested kala-azar.

I wish to express my thanks to Dr. S. Bhattacharjee who was in charge of the patient for permission to record this case.

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AN ABDOMINAL PREGNANCY DEVELOPING TO FULL TERM

By AUSTIN DA SILVA, B.M.S.

Civil Surgeon, Thana and Bombay Suburban Districts, Thana

K. R. P., aged 26 years, 4th para, was admitted into the Civil Hospital at Thana on the 12th June, 1936, for what she said was a 'missed labour'. She had visited the outpatient department five months prior to this saying she was seven months' pregnant and complaining of rather troublesome foetal movements. She was examined by the hospital nurse who confirmed the diagnosis of seven months' pregnancy, having felt foetal parts and heard foetal heart sounds. She now sought admission as her time was long overdue, and as she had not felt foetal movements for about two months.

The patient stated that she found the abdomen had diminished in size.

On examination foetal parts were palpable, but no heart sounds were audible. The lie was vertical, the head having descended into the pelvis. This was confirmed by a vaginal examination, but the head could be best felt from the posterior fornix, behind the cervix. In addition to this a rounded centrally-situated mass extending to within a finger-breadth below the umbilicus was palpable; this resembled the fundus of an enlarged uterus. The unusual character of the swelling was that the vertically lying foetus seemed to be to the right of and extend to a much higher level than this rounded surface. The cervix was small, firm, hard, and did not have the soft feel common in advanced pregnancy.

The woman was in perfect health, with no fever, no anæmia, no icteric tinge or any sign of any toxic absorption. She gave a history of slight pain in the 9th month followed by a bloody discharge *per vaginam* lasting a week.

With this uncertain diagnosis, between missed labour and a possible ovarian cyst, it was decided to dilate the cervix, explore and evacuate the uterus *per vaginam* if possible, or else to perform a laparotomy. Both sets of instruments were prepared and the patient was operated on on the 14th.

On dilating the cervix with Hegar's dilators and introducing a finger into the uterus, it was found to be empty and the presenting head lay outside the uterus in Douglas' pouch. The abdomen was then opened and a full-sized dead foetus was found lying loose in the abdominal cavity, its feet extending to below the right lobe of the liver wrapped in folds of loosely adherent omentum, the body lying vertically, the arch of its back to the right, and its head in Douglas' pouch.

There were soft thin web-like adhesions between the foetus and the ascending colon, the small intestine, the sigmoid flexure and the omentum. There was no liquor amnii; this had been so thoroughly absorbed that the membranes were completely adherent to the foetus so that they resembled a layer of the skin. The head was well covered with hair. It was flattened laterally, there being very little development of the frontal and occipital bones so that the two parietals seemed flattened against each other. This fortunately facilitated extrication from the pelvis, as otherwise a larger head might have resulted in impaction.

The disengagement of the foetus from the thin adhesions did not present much difficulty, and it was removed from the abdomen. Its umbilical cord was next traced back to the abdomen and found to arise from the large rounded centrally-situated mass, which I have already said resembled the fundus of a uterus on abdominal palpation. This mass was really the placenta much enlarged, rounded and adherent to the posterior surface of the left Fallopian tube, the abdominal ostium of the left Fallopian tube, the fimbriated end not being recognizable because of its encroachment. A large broad vascular band of omentum was adherent to the placenta and had to be ligatured and removed. It probably accounted for a large share in the blood supply of the peculiar rounded shape as a result of a hæmorrhage in its substance, placenta seemed to have acquired this peculiar rounded shape on section after removal. It was of peculiar fawn colour, was not vascular and organization following the hæmorrhage in its interior. This fact was responsible for the ease with which it could be removed from its base with the minimum of hæmorrhage, only two blood vessels having to be ligated.

There was no evidence of any previous hæmorrhage or blood clot in the abdomen, but I noticed small masses of what appeared to me to be meconium, adhering to the parietal and visceral peritoneum. The uterus was small, about two and a half inches in length, and had been pushed to the right by the placental mass which had come to occupy a central position. After swabbing out the peritoneal cavity the abdomen was closed. Beyond a slight rise of temperature on the two days following the operation the woman made a

good recovery, the stitches being removed on the tenth day. The foetus was $4\frac{1}{2}$ inches long and weighed 3½ pounds. The head was covered with hair, finger nails and sex organs had developed. The face and head seemed to have undergone lateral compression in Douglas' pouch, as a result of which the eyes were prominent and protruding and the occipital and frontal bones had not developed fully, the two parietals being flattened against each other.

Discussion

1. This was probably a case where the ovum was fertilized at the abdominal ostium of the tube and continued to develop there. There does not seem to have been any rupture of the tube at any time. The foetus lying in its covering of membranes seems to have developed to about term when, either as a result of a small rupture and a gradual leak of liquor amnii or of the hæmorrhage in the placenta, it died. I presume that there was gradual leakage of amniotic fluid from a small rupture because of the presence of small scattered adherent greenish-black masses resembling meconium all over the abdominal cavity, which must have escaped with the fluid. The sudden escape of a large quantity of amniotic fluid would almost certainly have given rise to symptoms of which the woman would have complained. It is doubtful whether such total absorption could have occurred through omental and other adhesions or otherwise without rupture.

2. The woman gave no history of any unusual symptoms during her term of pregnancy except of uncomfortable foetal movements, which is in keeping with textbook teaching. Her general health was remarkably good.

3. A decidua cast seems to have been passed at the time of the death of the foetus in the 9th month.

4. Cases of abdominal development of this size are rare.

5. The fertilization of the ovum at the open end of the tube is rare.

A CASE OF HYSTERICAL MONOPLLEGIA*

By S. P. WANCHOO, M.B., B.S., M.R.C.S., L.R.C.P.
LIEUTENANT, I.M.S.

Combined Indian Military Hospital, Bannu, N. W. F. P.

SEPOY N. S. was admitted into the Combined Indian Military Hospital, Bannu, on 25th September, 1935, from the Combined Indian Military Hospital, Mari-Indus, for further investigation and treatment.

History.—One month ago, while on leave, he got fever and a painful swelling on the left side of the neck, extending to the left shoulder. He reported sick at the military hospital, Mari-Indus, where, upon examination, the swelling was found to be hot and semifluctuant. On tapping the swelling, no fluid was found; there was no tenderness of the cervical spines, the neck was slightly rigid; the cervical glands were enlarged. The swelling was so acutely painful that he did not move his left upper limb at all. After a few days he felt slight weakness of his left arm. After a

fortnight the swelling subsided, but the paralysis of his arm became complete, with a total loss of sensation in that limb.

The man was an intelligent and a very highly-strung individual.

Examination.—Neck—nothing abnormal.

Motor system.—Left shoulder drooping, left pectoral region wasted, left arm and forearm atrophied; thenar and hypothenar eminences almost gone, fingers of left hand flexed at the interphalangeal joints. No active movement present in the whole limb.

Measurements.—Left arm .. 9 inches
Left forearm .. 8 "
Right arm .. 11 "
Right forearm .. 10 "

Reflexes.—Pupils react to light and accommodation; biceps jerk present on both sides, weak on the left, abdominal reflex present, knee and ankle jerks present. Plantar reflex sluggish; flexor type.

Sensation (left upper limb).—Lost in the hand, forearm and arm, except inner and outer side of the upper part of the arm, present over the shoulder. There was, however, imperfect localization of sensation in the upper part of the arm.

Pain, heat, cold, muscle and vibration senses.—Loss corresponds to tactile sensations. Sphincters—normal. Eyes—no nystagmus, fundus—normal. Blood pressure—125 systolic, 75 diastolic. X-ray of neck and chest revealed no lesion in vertebræ or ribs, no cervical rib present. Wassermann reaction—negative.

Cerebro-spinal fluid.—Wassermann reaction and Kahn's test—negative. Albumin content of cerebro-spinal fluid—0.025 per cent (this being low excludes tumour in the spinal canal).

When he was asked to flex his forearm, his triceps was found to be contracted, without any flexion being brought about. The man obviously tried hard to carry out this movement. When he was asked to extend his forearm, his biceps was found to be contracted, without any extension being brought about. This contraction of the antagonists (instead of relaxation) without contraction of the prime movers was suggestive of hysterical paralysis. The paralysed limb was put on an abduction splint for the shoulder and an extension splint for the fingers. He was given massage, distilled water injections and suggestion treatment for 15 minutes every day.

About 10 days later, slight movement (flexion and extension) of the thumb was regained.

After that gradual improvement in all the muscles set in; the distal part of the limb, regaining movement prior to the proximal part. Later on sensation also began to return in the same order as the muscle power. The following feature about the regaining of his sensation is of interest. When the water injections were given just above the site of the anæsthetic area, sensation next morning was invariably found to be regained just below the site of injection. The injections were intentionally suspended for about three days with the result that the recovery of his sensation also stopped, only to recommence when the injections were restarted.

A few days afterwards he was able to lift small weights. After another fortnight his muscle power was entirely regained and his measurements at that time were as follows:—

Left arm .. $10\frac{1}{2}$ inches Right arm .. 11 inches
Left forearm $9\frac{1}{2}$ " Right forearm 10 "

He was discharged to duty and has been quite fit since then.

Comment

The patient, apparently a highly-strung individual, got an acute, painful swelling on the left side of the neck, extending to the left shoulder. While in bed with this swelling, he did not move his limb at all, probably for fear

* Rearranged by Editor.

of getting pain. The effect of keeping his limb immobile for a fortnight evidently acted so much on his mind that even after the swelling had subsided he found he could not move his limb. In course of time it went on to actual flaccid paralysis with wasting of the whole limb. Along with it, there was also complete anaesthesia.

It is evident, from the progress of the case, that injections of plain water and suggestion treatment effected a cure, and that the condition was hysterical.

SERUM TREATMENT IN A CASE OF ACUTE STAPHYLOCOCCAL SEPTICÆMIA*

By S. P. WANCHOO, M.B., B.S., M.R.C.S., L.R.C.P.
LIEUTENANT, I.M.S.

Combined Indian Military Hospital, Bannu, N. W. F. P.

JEMADAR A. R. was admitted to the Combined Indian Military Hospital, Bannu, on 7th August, 1935, complaining of fever and severe headache of two days' duration.

Total leucocyte count—17,500.

Differential count:—Polymorphonuclears—77 per cent, lymphocytes—22 per cent, eosinophiles—1 per cent; hæmoglobin percentage 85 per cent; red blood cell count—4,120,000.

The patient did not sleep the night after admission, his temperature remained high and he appeared extremely ill.

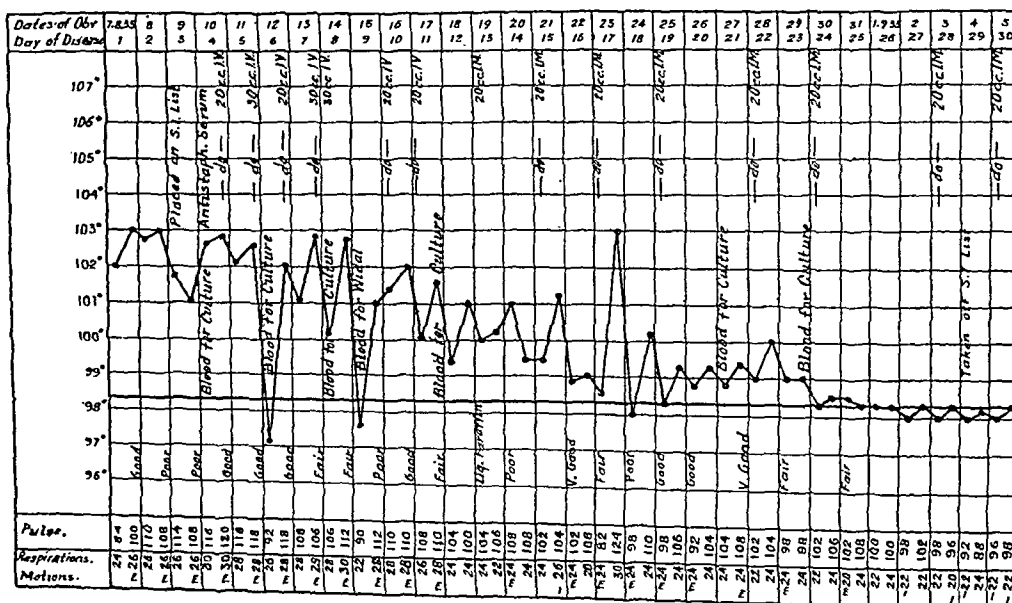
On the 9th of August the condition was unchanged. The blood cultures were negative for the enteric group but *Staphylococcus albus* was grown.

Anti-staphylococcal serum was not obtainable locally but the next day a dose of 20 c.cm. was procured and injected intravenously. The leucocyte count was now 20,000 and the man was in a serious state with a dry cracked tongue. On the evening of the next day (11th) another 30 c.cm. of anti-staphylococcal serum arrived and was given immediately. The next morning there was great improvement. The temperature dropped to subnormal but the blood was found still to contain staphylococci. The following day the temperature again rose, the urine still contained albumin and urobilin and a few red cells were present. He was given another 30 c.cm. of serum.

On the 14th of August the total leucocytes were 275,000 and the blood was found still to contain *Staphylococcus albus*.

The subsequent course of the disease and main treatment is shown on the chart. After the 5th September

Name... Athma Ram. Age... 39 years. Disease... Acute Staphylococcal Septicæmia
Date of Admission... 7.8.35. Date of Discharge... 24.9.35. Result... Cured.



Previous history.—Nothing pertaining to the present illness.

Clinical notes.—On admission his temperature was 103.4°F., pulse—114, respiration—26 per minute, bowels constipated, tongue furred but moist, throat normal, conjunctivæ tinged yellow.

Spleen just palpable, abdominal reflex present but sluggish.

Heart and lungs normal.

No rigidity of neck; Kernig's sign absent. On further examination a small boil was detected on the left elbow; it had burst by itself.

Urine.—High coloured, specific gravity—1020, albumin present, sugar present, urobilin present.

treatment was discontinued and the patient was discharged cured on the 24th of that month.

Summary.—Duration of illness was 7 weeks. *Staphylococcus albus* was grown in blood culture six times. Anti-staphylococcal serum therapy was started quite early. From the survey of the case sheet and the temperature chart it is evident that the patient reacted very well to the serum therapy. Immediately after the injection there was a rigor, after which the temperature invariably came down.

Total serum given = 350 c.cm.
Intravenously = 170 c.cm.
Intramuscularly = 180 c.cm.

* Rearranged by Editor.

CLAVICLE IN TWO PARTS

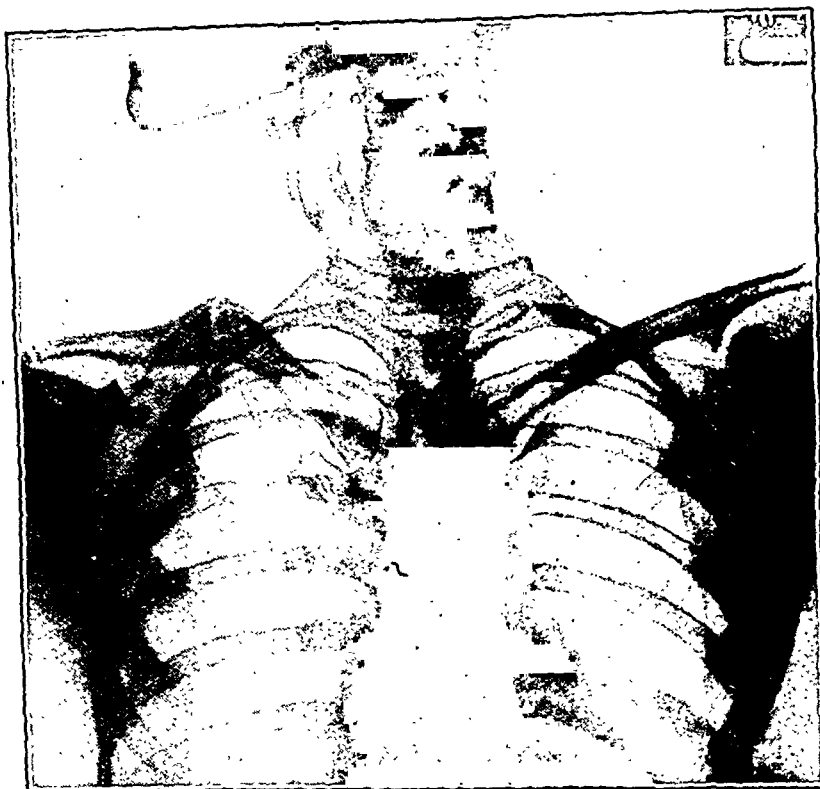
By T. SESHACHALAM, L.M.S. (Mad.), M.R.C.S. (Eng.),
L.R.C.P. (Lond.)

Surgeon, Krishnârajendra Hospital, Mysore

IN the course of a routine examination of a patient a symptomless swelling was found in the middle of the right clavicle which was provisionally diagnosed as

separated by a short or a long piece of fibrous tissue is clinical evidence in support of Professor Fawcett's view. In this condition the ossific centres of the clavicle have not fused but have grown separately.

In the case herein described the clavicle being in two halves, each half exhibiting all the characteristics of a long bone with a distinct



an osteo-chondroma. Radiography revealed this clavicle to be in two portions connected together by a diarthrodial joint. Each part presents the characteristics of a long bone with a shaft and two extremities, the contiguous ends being broad and composed of cancellous tissue covered by a thin layer of compact bone (see figure). There is a bony process in both clavicles, articulating with the corresponding coracoid process. The left clavicle is normal except for this extra process. There is no interference with the movements of the right upper extremity.

The clavicle is the earliest bone in the body to ossify. Its ossification is peculiar in that it goes through a precartilaginous stage which quickly undergoes ossification. Professor Fawcett has demonstrated the presence of two centres of chondrification in the clavicular mesenchyme in the seventh week, when the embryo is 15 mm. in length. Very soon afterwards two centres of ossification appear in the adjacent borders of these precartilaginous masses. These two ossific centres quickly fuse into one and from then onwards ossification proceeds as from a single centre.

The disorder known as cleido-cranial dysostosis where the membrane bones are imperfectly ossified and the clavicle appears in two pieces

and typical diarthrodial joint connecting them, lends further and stronger support to this view.

TREATMENT OF AN INOPERABLE PANCREATIC CYST

By S. C. DAS GUPTA, L.M.S. (Cal.), M.A.C.P.R. (U. S. A.)
Surgeon Superintendent, Bir Hospital, Katmandu, Nepal

IN 1934, a Hindu lady, aged 42, was admitted into the Bir Hospital, Katmandu, for the treatment of a tumour in the epigastric region stretching across the vertebral column from the under surface of the liver to the anterior border of the spleen. The tumour was very tense, round in shape and almost immovable. Its longitudinal diameter was about 6 inches and the transverse about 11 inches.

After preparation, the patient was put under chloroform and the abdomen was opened by a longitudinal incision about 6 inches in length in the middle line above the umbilicus. The tumour became palpable, but not visible. An opening was made through the gastro-colic layer below the greater curvature of the stomach and also below the level of the gastro-epiploic vessels securing both the cut ends of the descending branches, and then both the layers of the transverse meso-colon were divided. As soon as the posterior layer was opened

a big cystic tumour was seen projecting. The tumour was too tense to be delivered through the abdominal opening. I aspirated the tumour with a large needle

condition and it has not recurred. I saw the patient about a fortnight ago, over two years after the operation, and she is quite well. On deep palpation a



attached to a syringe, and removed about a pint of fluid after protecting the surrounding parts carefully. I found the tumour with a very large wide base posteriorly, and extremely adherent to the posterior wall of the stomach, and therefore dismissed the idea of excision.

The loose wall of the cyst was pulled out through the gap between the stomach and transverse colon, and the outer coat of the cyst wall was sutured to the meso-colon and then the cyst was brought out through the abdominal parietes and sewn to the parietal peritoneum. The wound was closed above and below the projecting cyst, and finally the wall of the cyst was fixed to the subcutaneous tissue by a series of commissural sutures.

I completed the operation after 48 hours as advised by Gussenbauer; the cyst was opened by a small longitudinal incision and the contents were emptied; the fluid measured about four pints. A drainage tube of large calibre was inserted with a protective dressing of vaseline around it, in order to prevent irritation of the skin by the discharge from the cyst; but it did not drain properly, so on the fourth day the drainage tube was connected with one arm of a 'Y' tube, and the other arm with a douche, while the lower end of the 'Y' tube was connected with a bottle by means of a long tube, as is done for suprapubic drainage, so that the fluid contents of the cyst were removed by suction, and gradually the sac collapsed.

After treatment.—Every four hours the douche-cock was opened to allow the fluid to run out and the tumour was drained thereby of its content. Every day about a pint of fluid was drawn off. Then, in order to produce inflammation within the cyst wall, I started washing out the cavity with 5 per cent tincture of iodine. After six weeks the cavity was almost obliterated, but a small fistula was left, which resisted all treatment, medical or surgical, until the woman was given a rigid diabetic diet as suggested by Wohlgemuth and Karewsky, and the wound healed up completely at the end of the fifth month.

On the tenth day after operation the patient suddenly developed signs of acute obstruction. Hot fomentations, withholding of all food, liquid paraffin and belladonna and repeated rectal enemas relieved the

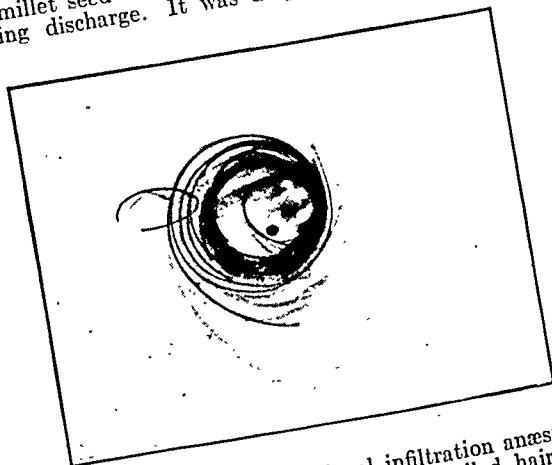
shrivelled nodular lump in the epigastrium behind the stomach could be felt, but there was no tenderness.

AN UNUSUAL SEBACEOUS CYST

By T. SESHACHALAM, L.M.S. (Mad.), M.R.C.S. (Eng.),
L.R.C.P. (Lond.)

Surgeon, Krishnarajendra Hospital, Mysore

AN adult male, aged 40, consulted me for a small nodule on the face which periodically had discharged an offensive purulent material for the last twenty years. On examination there was a small pimple of the size of a millet seed which on pressure exuded a very foul-smelling discharge. It was diagnosed as a sebaceous



cyst and was excised under local infiltration anaesthesia. On cutting into the cyst a perfectly coiled hair came out and partially uncurled (see figure). The cyst was found to be lined with modified skin. The hair was 22.5 cm. long.

This is an instance of a reversed hair follicle and the hair has grown uninterruptedly in a coil like a hair-spring within the cyst.

Indian Medical Gazette

OCTOBER

THE TREATMENT OF PEPTIC ULCER

THE treatment of gastric and duodenal ulcer—or peptic ulcer, to use a generic term for the two lesions—has been the field for a very healthy struggle between the physician and the surgeon during the last two decades. Like that of so many battles the result has not been decisive, but a fairly reasonable compromise has been the outcome. We have purposely used the word 'reasonable' because the present state of the treatment of peptic ulcer cannot in any way be called satisfactory. The 'follow-up' statistics do not lead the practitioner towards an optimistic outlook when he makes a diagnosis of chronic peptic ulcer; and whether he recommends his patient to go to a surgeon or decides that medical treatment is indicated, he cannot honestly give a very bright prognosis. For the purposes of discussion it is necessary to consider gastric and duodenal ulcers separately, as in the latter condition the immediate danger is small and the chances of complete cure are distinctly better in the surgically treated cases. In gastric ulcer, however, the facts are very different; the cure rates are almost equal, whether medical or surgical treatment is given, but against the surgical treatment is a very high immediate risk, which in two of London's leading hospitals is calculated at 15 and over 20 per cent, respectively. It is taking a serious responsibility to recommend a patient to undergo such a risk when an equally satisfactory result might be obtained by medical treatment alone with very little risk, unless there are very definite special indications. With the first part of this sentence both physician and surgeon will probably agree; it is in the interpretation of the qualifying clause that there will be differences of opinion.

The positive indications for surgical treatment against which the most conservative physicians can scarcely make a good case are perforation, pyloric stenosis and deep ulceration with adhesions to surrounding structures. Repeated severe hæmorrhages and failure of medical treatment are not considered by many physicians to be legitimate reasons for passing their patients on to the surgeon; surgical interference is by no means a guarantee against recurrence of hæmorrhage and the early failure of medical treatment may later be followed by success. In both these cases there is much to be said from the surgical point of view, more especially in the latter, as after repeated failures

of medical treatment, if the symptoms of the patient are interfering with his normal activity, the alternatives are to condemn him to permanent invalidism or let him undergo the risk of surgical treatment. With the alternatives put to them in that way most patients would choose operation. Two other indications for surgical treatment that are often quoted are really *ultra vires*. The first, an important one from a practical point of view, is the suspicion of malignancy which may be aroused by a rapid onset in a patient of late middle age; this is a very difficult problem but not strictly one of the treatment of peptic ulcer. The second is that the patient's economic status and home surroundings are not such that medical treatment could be satisfactorily carried out. This is often urged as a strong reason for adopting surgical treatment in this country, but the treatment in a surgical case does not cease when the patient leaves the operating table, or even when he leaves the hospital, and in unsuitable home surroundings his chances of satisfactory progress are not particularly good.

The principles of the medical treatment are to reduce the movement of the stomach as much as possible and to prevent the ulcer being bathed by a strongly-acid gastric secretion. This can be achieved by diet and by the administration of alkalis. A number of diets have been devised and bear various names, and very elaborate menus have been drawn up; these are usually arranged to give a gradually increasing diet. Most of these are American in origin and quite useless to the worker in India whose patient could not get many of the substances mentioned, even if he knew what they were; further, the rationale of the graduation of the diet is questionable, and it is far more reasonable to settle on a dietary régime that, in its easy assimilability, its acid-absorbing qualities, and its caloric value, suits the requirements of the case, and to maintain it until the ulcer is healed. Milk, or proprietary milk foods, and eggs form the basis of the diet; this must be given in hourly feeds of about three ounces, or two-hourly feeds of six ounces with a dose of alkaline mixture at the alternate hour. It is essential that treatment should be continued at night, and a feed of milk and a dose of alkali should always be within the patient's reach, though of course the strict hourly régime is not only unnecessary but would be disturbing. This strict diet has to be maintained for some weeks after which gradual extension is allowed but the dietetic course lasts at least six weeks, during the first half of which strict rest in bed should be enforced. Some physicians give belladonna to decrease gastric secretion and olive oil to decrease acidity and as a mechanical protection to the ulcer crater.

This long period of enforced idleness and monotonous diet are a great trial to the patient

even in cases in which the financial aspects have not to be considered, it is therefore not surprising that anything in the way of a new form of treatment in which this long dietary régime can be omitted or modified is always welcome. An example of such a treatment is the histidine treatment that was first introduced about three years ago. This treatment rests on a very slender experimental basis which recently has been ruthlessly shaken if not completely knocked away, but meanwhile the treatment has acquired a much more solid foundation on clinical trial which will not be demolished nearly so easily.

The experimental basis is shortly this; that if the pylorus of a dog is anastomosed with the lower portion of the trans-sected jejunum of which the upper portion is implanted into the lower end of the ileum, so that the gastric contents pour into the jejunum and the duodenal secretions, including the bile and the pancreatic juice, pass through the upper end of the jejunum and thence directly into the lower end of the ileum, peptic ulcer will invariably follow. Weiss and Aron explain this on the grounds of the consequent interference with protein digestion; the polypeptides that are produced by the action of the gastric juice not being broken down further by the pancreatic trypsinogen into amino-acids as in normal digestion. It is claimed that histidine together with certain other amino-acids cannot be synthesized by the body cells and therefore must be absorbed as such. These workers surmised that some of the amino-acids are essential to the maintenance of an intact mucosa (histamine which is synthesized in the body cells from histidine has a marked action on gastric secretion). To prove this they carried out an experiment with six dogs on which the (Mann-Williamson) anastomoses referred to above had been performed; to four they gave injections of histidine and tryptophane and two were kept as controls. The dogs that received the histidine injections, although they became emaciated and anæmic, did not suffer from peptic ulcer. It was on this single experiment that the histidine treatment was started clinically.

It has been pointed out that there are many other explanations for the peptic ulceration that occurs after the very gross interference with normal digestion of dogs following the Mann-Williamson anastomoses, in which not only the protein digestion but the fat and carbohydrate are also interfered with. Further, if the pancreatic digestion is interrupted by other means, e.g., by deflecting the pancreatic secretion into the ileum, ulceration does not occur with the same regularity. The original experiments have even been questioned and it has been suggested that the dogs were not kept under observation for a sufficient length of time.

The fact that normal gastric juice can cause ulceration in the intact gastric mucosa suggests

that there is some failure of the natural resistance of the mucosa, and it is reasonable to suggest that this failure of resistance is due to a nutritional deficiency of the cells, a vague expression, but that this deficient substance is histidine is a very far guess.

There is thus left very little experimental support for the theory on which the treatment was originally based. Statistical evidence seems never to have been evoked. The peptic ulcer patient, in Europe and America at any rate, usually comes from social classes in which there is no evidence of deficiency of histidine precursors in the diet, and the individual patient seldom gives a history of taking a low protein diet. Further, no evidence has been produced to show that the tryptic digestion is impaired in patients with peptic ulcer, or that patients in which there is interference with tryptic digestion are particularly liable to peptic ulcer.

The reports of the clinical use of histidine, however, present a very different picture, and even the severest critics of the theoretical basis seem to have had results which encourage them to continue the use of histidine on an empirical one.

The actual treatment consists in giving a course of twenty-four injections of histidine monohydrochloride. The injections are given daily, either subcutaneously or intramuscularly in doses of 5 c.cm. of a 4 per cent solution. The most enthusiastic supporters of the treatment suggest that no other treatment is necessary; thus, rest—physical and mental, alkalis, dietary restrictions, and control of habits (smoking and alcohol) have been dispensed with.

The first clinical report in Great Britain was that of Bulmer who treated a series of 54 patients in Birmingham. He claimed complete success in 58 per cent of cases and symptomatic success in another 19 per cent; in the latter the radiological evidence of ulcer remained but the patients became symptom free. Of those cured patients whom he was able to follow up, one-sixth relapsed. This compares very favourably with the relapse rate following ordinary medical treatment with diet and alkalis. The results were distinctly better in gastric than in duodenal ulcer. Many smaller series of cases have been reported in which the treatment has been equally successful.

In America the results have not been so satisfactory. A rapid disappearance of symptoms in the majority of patients treated is reported, and in many of these there has been radiological evidence of cure of the ulcer, but there has been a high percentage of early recurrences. Parallel series treated with diet and alkalis have usually shown an equal percentage of immediate remissions, but a much higher percentage of apparent cures in the cases kept under observation for six months or more.

Observations regarding the effect on gastric secretion are very confusing. Both British and American workers have reported a marked decrease during histidine treatment (though control of gastric secretion forms no part in the theoretical case for histidine), whereas others have shown that an increase occurs in just as many cases.

With the breakdown of the original hypothesis, it is necessary to look round for some other explanation for the clinical success of the treatment. A number of suggestions have been put forward: firstly, that the effect may be entirely psychological; this seems unlikely, but is within the region of possibility as the mental state of the patient is known to have a profound influence on gastric mechanism and secretion, and the suggestion is supported by an experiment in which normal saline injections were given in a series of cases, with a high percentage of satisfactory results: secondly, that the results are due to non-specific protein reaction and in support of this is quoted a series in which good results followed milk injections. The local absorption of protein may cause a stimulation of leucocytes and antibodies which will have a favourable effect on the chronic inflammatory tissue of the ulcer, or it may stimulate the sympathetic and thereby cause decreased gastric motility and possibly

secretion. Still another suggestion is that histidine, which is known to stimulate nasal secretion, may cause a general increase in secretion of mucin which acts mechanically by forming a protective coat over the ulcer.

Whatever the rationale of the histidine treatment the general consensus of published opinion appears to be favourable, and can be summarized as follows:—

Histidine is undoubtedly a new therapeutic agent of some considerable value in the treatment of gastric and duodenal ulcer, particularly of the former. It is however equally certain that it does not provide the last word in the treatment of peptic ulcer and that the temporary nature of the improvement in most cases makes it doubtful if the histidine treatment should be allowed to replace the well-tried diet and alkali treatment, except in very special circumstances. The present position therefore is that in mild and moderately severe cases of peptic ulcer histidine should be given in conjunction with alkalis, and as restricted a dietary régime as the circumstances (whether an ambulatory or a bed case) permit and the severity of the symptoms indicate.

Thus, by a process of irrelevant experimentation and false deduction something in the way of a tangible advance in the treatment of peptic ulcer appears to have been achieved.

^cMedical News

PHARMACEUTICAL SOCIETIES MEET

PROF. SCHROFF'S LECTURE

UNDER the joint auspices of the U. P. Pharmaceutical Association and the Benares Hindu University Pharmaceutical Society, Prof. M. L. Schroff delivered a lecture on the 'Manufacture and Storage of Drugs in India'. Captain S. K. Chowdhury occupied the chair.

Prof. Schroff dealt at length with the drug trade in India. He said that India still depended on foreign countries for her supply of drugs. About two crores worth of drugs alone (exclusive of chemicals and narcotics) were imported into India annually and out of these a great many were of doubtful value and not an insignificant number quite useless. Some Indian concerns were also selling spurious drugs under fictitious European names. As regards the manufacture of drugs in India, he described the condition to be very pitiable. None of the Indian concerns, not excluding some of the most reputable ones, had any qualified pharmaceutical chemist on its staff and hence the manufacture of drugs was in the hands of persons who while knowing the art of pharmacy were quite ignorant of the pharmaceutical science. This accounted for some of the preparations of even the most reputable firms being of doubtful value. He said that many pharmaceutical concerns had no arrangement for the standardization of drugs and hence the medicines manufactured by these should be taken with caution. These concerns did not even want to employ qualified men as the standardization of drugs would deprive them of some of the profits.

Storage of drugs hopelessly bad

Coming to the storage of drugs, Prof. Schroff condemned the methods of storage to be unscientific, definitely harmful, and obsolete. No drugs manufactured by the most up-to-date scientific methods could retain their potency under the storage conditions prevailing in India. It was partly due to this fact that persons suffering from various diseases improved when they went abroad but the same medicine did not do them any good in India. He described the storage of some of the biological products and demonstrated beyond the least doubt that the inefficiency of a great many medicines was due to the bad storage conditions. He said, 'vaccine lymph is stable for long periods only when stored below 0°C.; above this temperature its potency is definitely maintained for relatively short periods, namely, for three months with storage at 0° to 5°C., for one month at 5° to 10°C. and one week above 10°C. From this it will be clear to all that when we are getting ourselves vaccinated here, where the average temperature is between 25° to 35°C., we do not know whether we are getting ourselves vaccinated with a useless vaccine or a potent one. Similar considerations hold good for various sera, antitoxins, etc., and if these preparations are left over unsold during the summer months one can well imagine the kind of injections he is taking. When we know that cholera, typhoid, plague, etc., are more likely to occur during the summer months, then the vaccines for the same have to be stored during summer months and in India every medical hall tries to exhibit such preparations

under conditions decidedly detrimental to the efficacy of these drugs.

Prof. Schroff then described the storage of vitamin preparations which should be kept in a cool place protected from light and he found that even the big drug stores were ignorant of these elementary facts. He quoted cases where he discovered that halibut-liver oil was being sold in the market with the rubber cap dissolved in the vitamin solution due to heat. Regarding hormone preparations he said that there is a time limit for the use of these and beyond that time the efficacy may be destroyed and in this connection he detected at a large drug store that pituitary preparations were sold two years after they were time barred, i.e., preparations not to be sold after August 1932 were sold even in June 1934. Again he quoted a case where a proprietor of a burnt drug store sold his spoiled medicines to a merchant in another town for sale as fresh and new medicines.

In conclusion he appealed to the Government to enact a pharmacy and drugs act on the lines recommended by the drugs enquiry committee and declared there was an urgent need of creating a strong public opinion on the lines indicated above so that the suffering humanity may be saved from the clutches of unscrupulous manufacturers and ignorant distributors.

Captain Chowdhury agreed with Prof. Schroff in what the latter described regarding the drug trade in India. Captain Chowdhury said that he often found the hyoscyamus preparations not yielding results expected of them. Now he saw the reason of the inefficacy of the hyoscyamus preparations. He also felt that it was high time that the Government took action and enacted the pharmacy and drugs act. Such an act will be a boon not only to suffering humanity but also to the medical profession as a whole as it would place at their disposal drugs of standard quality.

INDIAN JOURNAL OF VENEREAL DISEASES

It is always a moot point how far specialist journals defeat their main avowed object, namely, to give prominence in the mind of the practitioner to the specialty that they represent. The practitioner, in this country in particular, can seldom afford to take in more than one journal, he can often ill afford even that, and it would be unwise for him to choose anything but a journal that includes all medical subjects—in *sensu lato*—in its scope; it is therefore mainly the venereal specialist that buys the special, venereal journal, the ophthalmologist that buys the ophthalmological journal, and so on. The danger lies in the possibility that the specialist journal will collect to itself all papers on its own subject which would in other circumstances have been sent to papers that are read by the general practitioner.

However, that is not the only object of specialist journals, and further it is a danger that can be obviated.

We have now received some half dozen numbers of a quarterly journal on venereal diseases. There was certainly room for a journal devoting itself to this subject, as there are now many venereal specialists in India and many others, sanitarians and social workers, who have a special interest in this important subject. The numbers we have seen contain very useful articles from Indian contributors; there are others from foreign contributors. They also contain reviews of books, reports of meetings, and some very valuable extracts from other journals, both Indian and foreign, on venereal and allied subjects.

A claim to which prominence is given is that this journal has an international board of editorial collaborators. We can see nothing to be gained by this. A journal published in India should get her contributions from those who are working in India and understand Indian conditions. It is our experience that would-be contributors from abroad send their papers

to us because they fail to get them accepted in their own countries. By this we do not mean that we have nothing to learn from outside India; there is very much to be learnt, but this can be done by printing extracts, or by arrangement reprinting whole articles, from foreign journals. There are of course exceptional instances where a foreigner has done some investigation in a tropical disease and naturally the best place for such a paper to appear is in a journal in a tropical country.

Our new contemporary is maintaining a reasonably high standard of publication, and, as we have remarked above, the indigenous contributions are good. We wish the promoters every success in their venture.

LEAGUE OF NATIONS INFORMATION SECTION

LEAGUE OF NATIONS PUBLICATION ON THE NUTRITION PROBLEM.

THE mixed committee on the problem of nutrition, which includes experts in the fields of public health, agriculture, economic policy and social assistance, is submitting to the 1936 Assembly of the League of Nations a report in four volumes.*

Volume I—Interim report of the mixed committee on the problem of nutrition—constitutes the report proper. This first interim report is confined in the main to an analysis of the problem and a statement of the experts' conclusions with regard to the important relationship existing between a proper dietary on the one hand, and, on the other, public health and the control of disease.

Serious 'danger spots' where deficiency diseases are rampant have appeared since the crisis. Unfortunately, however, malnutrition is more than a symptom of the depression: it is a chronic ill in every country, even in areas where the standard of living in other respects has remained unimpaired. There is no country in which the population as a whole attains the standard of nutrition essential to the maintenance of health and energy.

The widespread adoption of a proper dietary implies two requirements—(1) adequate income, and (2) knowledge of the foods which contain the elements essential to a well-balanced and adequate nutrition. The first requirement is discussed in connection with schemes of public assistance, agricultural production, marketing and price control.

With regard to the second, the report recounts the discoveries of modern science in this field and gives a list of the foods easily available in countries of the West in which are found the essential vitamins and mineral salts.

Milk is the nearest approach to a perfect food that man knows. 'A land flowing with milk' is the aim of

* *The Problem of Nutrition*. League of Nations. Geneva. 1936.

Volume I. 98 pages, 2 shillings.

Volume II. Report on the Physiological Bases of Nutrition—drawn up by the Technical Commission of the Health Committee at the meeting held in London (November 1935). Revised and amplified at the meeting held at Geneva (June 1936). League of Nations.

Volume III. Nutrition in Various Countries. League of Nations. Pp. 271. Price, 5s. 6d.

Volume IV. Not yet received.

Obtainable from India: The Book Company, Ltd., 4/4A, College Square, Calcutta, and League of Nations (Indian Bureau), Improvement Trust Building, Esplanade Road, Bombay 1.

the modern nutrition expert as it was the aspiration of an ancient pastoral people. Fresh green vegetables and fruits, especially citrus fruits, meat, eggs and cheese furnish the important 'protective' vitamins. The potato, long banished from diets by 'slimming' experts, is re-established as being a valuable source of calcium, and the only vegetable whose vitamin C content remains unimpaired after cooking.

The problem of making these foods available to all ranks of its population should be a first charge upon every government. The committee indicates, though it does not for the moment fully investigate, the obligations which this charge will impose upon governments: (1) the adaptation of agricultural undertakings to produce in greater quantity the foods shown to be necessary to health; (2) the adoption of social, economic and commercial policies designed to make these necessary foods available to low and average incomes; (3) the furnishing of popular instruction in the respective values of available foods for healthy growth.

The second of the four volumes on the problem of nutrition which will be submitted to the 1936 Assembly is confined to a study of the physiological bases of a proper dietary. It reproduces the standards of adequate nutrition which were drawn up by the technical committee of the League's Health Committee after a period of expert study and consultation.

When the economic depression began to reveal grave problems of nutrition (problems which did not, it is true, appear only as a result of the crisis, but emerged into sharper relief with growing unemployment), the Health Organization published a valuable study on 'Diet in relation to small incomes',* by Dr. W. R. Aykroyd.

The forerunners of the present report on the physiological bases of nutrition may be found in the conclusions of two conferences of dietary experts—one which met in Rome in September 1932 and drew up a scale of coefficients of dietary needs which could be adapted internationally and so render comparable the results of experiments in nutrition carried out in different parts of the world; a second, which met in Berlin in December 1932 to study clinical and physiological methods for the treatment of malnutrition and deficiency diseases.

The present report is of a technical nature. It defines the basic dietary needs of the average adult male and female, and for certain special cases (heavy manual labour, pregnant women, nursing mothers), in terms of caloric, protein, fat, mineral and vitamin content. The case of children is given special attention: the report contains tables defining in terms of foodstuffs easily available in the West (a) protective foods, (b) energy-giving foods suitable for infants of 1 to 2 years, of 2 to 3 years, of 3 to 5 years, of 5 to 7 years, and children, girls and boys, of 12 to 14 years.

Another table shows the foods which will furnish the essential protective, energy-producing and caloric content for the diet of pregnant women and nursing mothers.

The report indicates dietary problems about which further study should be made; methods of discovering malnutrition in children; dietary needs during the first year of life; minimum requirements for vitamins, minerals and fats; the nutritive value of the different proteins, and the value of animal protein for healthy growth; relative nutritive value of the different cereals; the effect upon health of increased consumption of sugar; the influence of climate on dietary needs; consumption of milk to be desired for children of different ages.

[An abstract from the report on which this was based appeared in our March issue, but those interested in

this important problem should get the full revised report.]

The third volume of the report which the mixed committee on the problem of nutrition have prepared to submit to this year's Assembly furnishes a factual basis for a survey of this important question in both urban and rural districts throughout the Western world.

The report is prefaced by a chapter of 'general observations', and outlines the measures recently taken by governments, public authorities and national organizations in some twenty countries, in order to bring about an improvement in the dietary of their populations. These are grouped into the following chapters: (1) Measures taken on behalf of mothers and infants; (2) measures taken on behalf of children of school age and young people; (3) measures taken on behalf of adults, and in particular of unemployed adults; (4) army and navy dietaries; (5) measures to enable particular categories of consumers to obtain foodstuffs at reduced prices; (6) measures for ensuring the quality of foodstuffs; (7) research, education and popular instruction with regard to food values.

The report contains evidence on variations which have occurred in the consumption of foodstuffs in recent years in both advanced and less prosperous communities. Its editors make the following general observation upon the facts which it presents:

'Taking a general view of countries like the United Kingdom, France, Switzerland, Belgium and the Netherlands, the question of general food shortage is not a matter for anxiety. Thanks to their wealth and their highly developed communications and widespread facilities for distribution, these countries are not exposed to the danger of scarcity. It is true that, among industrial or agricultural workers who have been particularly hard hit by unemployment or trade depression, large numbers may be underfed as the result of lack of purchasing power, in spite of the considerable efforts made to assist them. For the great majority of the population, however, the nutrition problem—though at first a problem of income—is in the main a problem of quality, balance of diet, hygiene and education.

'If in these countries the dietary is bad, it is due less to any deficiency of diet than to the fact that it is ill-balanced and incomplete, containing, perhaps, an excessive proportion of certain substances, while at the same time deficient in important constituents. Very appreciable progress seems nevertheless to have been made, in spite of the limitations imposed since the war by economic difficulties, and it would be valuable to be able to show to what extent these current changes in consumption are in the direction of more rational nutrition.

'In other countries, the necessity for providing means of subsistence for distressed sections of the population or for whole areas of the country is the primary purpose of endeavour. Where widespread poverty and distress have resulted from the destruction of trade and the loss of employment which the economic crisis brought about, the question is not one of establishing an ideal nutrition, but of securing sufficiency. The same is often true in more backward countries'.

In addition to the countries mentioned in the passage quoted above, the report furnishes information on some aspect of the whole problem with regard to: the Union of South Africa, Australia, Austria, Bulgaria, Czechoslovakia, Canada, Denmark, Estonia, Finland, Hungary, Italy, Iraq, Latvia, Mexico, Poland, Roumania, Siam, Sweden, Turkey, United States of America, Uruguay and Yugoslavia.

SIR HENRY WELLCOME

A BIOGRAPHICAL SKETCH

SIR HENRY WELLCOME was born in Wisconsin, U. S. A., and spent his early childhood in the midst of the Dakota Indian tribes. He attended the schools of the

* *Quarterly Bulletin of the Health Organization*, Vol. II, Nos. 1 and 2, 1932.

frontier, including one which was held in a typical Western log school house.

Having at an early age chosen chemistry and pharmacy as his career, Sir Henry Wellcome studied these and cognate subjects in Chicago and Philadelphia and shortly after taking his diploma at the latter city went to New York, where his strong bent towards literary activity was shown by various articles contributed to the scientific journals.

Sir Henry Wellcome visited most parts of the North American Continent, and finally South America, where he studied the native cinchona forests. On his return from South America, he contributed to scientific publications the result of his observations. Attracted by the idea of London as an ideal manufacturing and distributing centre for chemical industries, he decided to make England his future home, and, in conjunction with the late Mr. S. M. Burroughs, established the firm of Burroughs Wellcome and Company, now known all over the world as manufacturers of fine chemicals, alkaloids and pharmaceutical products.

The business, founded in London in 1880, has increased with extraordinary rapidity, and besides the extensive chief works at Dartford, Kent, now has works, offices and warehouses in most of the great centres of commercial activity throughout the world, such as New York, Montreal, Sydney, Cape Town, Milan, Shanghai, Bombay and Buenos Aires.

Sir Henry Wellcome became a naturalized British subject in 1910.

From the first he has been greatly interested in the educational and social betterment of his staff and employes generally. As a part of the general scheme many years ago, he founded a club and institute (with park and grounds for field sports and games) in connection with his chief works at Dartford, and very considerable sums of money have been expended to provide technical instruction and promote mental and physical recreation.

In 1924 the Wellcome Foundation was formed with Sir Henry Wellcome as Governing Director to take over the business of Burroughs Wellcome and Co., and founded by the Director.

In addition to the development of applied science as carried on in the thoroughly equipped, experimental laboratories at the Wellcome Chemical Works at home and abroad, Sir Henry has shown his practical interest in general scientific research work by the establishment of a series of research institutions and research museums.

The first of these was the Wellcome Physiological Research Laboratories, originally established in London in 1894 and moved subsequently to Brockwell Hall, Herne Hill, and finally to Langley Court, Beckenham, Kent. Then followed the Wellcome Chemical Research Laboratories established in London in 1896.

For the greater part of his life Sir Henry Wellcome has collected relics, books and data in connection with the primitive customs and ancient methods of medical and surgical treatment, one of the results of which was that he organized the Historical Medical Museum, which was opened in London in 1913 at the time of the International Medical Congress. This museum, which is the most extensive of its kind in the world, contains a permanent collection of exhibits illustrating the development of medicine, chemistry and the allied sciences from primeval times. It embodies an extensive library of rare manuscripts and printed books. Its purpose is educational, and it is of great value to students and research workers.

Later, in 1913, Sir Henry Wellcome founded in London the Bureau of Scientific Research to co-ordinate the work of his separate research institutions as well as to undertake original investigations in tropical medicine, hygiene, sanitation and parasitology. This Bureau places its records, equipment and experience

gratuitously at the disposal of medical men, sanitary administrators and others interested in tropical medicine and hygiene, and, to further the convenience of research workers, enquirers and visitors, there is associated with it the Museum of Medical Science, illustrating the subjects in a graphic and readily accessible manner. Another research institution associated with the Bureau is the Entomological Field Laboratories originally located at the Royal Horticultural Society's Gardens at Wisley, Surrey, and now transferred to more commodious premises at Claremont, Esher, Surrey.

1931 saw the foundation of the Wellcome Research Institution, designed to embrace the various research laboratories and museums, etc., founded by Sir Henry, to provide for their extensive developments and to co-ordinate and extend their activities.

This new research building was erected on a site measuring 225 feet by 135 feet, at the corner of Gordon Street and Euston Road, London. On 25th November, 1931, the corner stone was laid by the Rt. Hon. Lord Moynihan of Leeds.

Each of the Wellcome Research Laboratories and Museums is conducted by its own Director separately from the business of Burroughs Wellcome and Co., and although in them a large amount of important scientific work is carried out for the firm, their main activities are original research in pure science, the results of which are embodied in scientific reports and papers presented at meetings of the learned societies or communicated through the ordinary channels of scientific publications. So far approximately 1,000 such scientific publications and reports have been issued.

Sir Henry Wellcome has throughout his life been a keen student of archaeology, and has carried out extensive explorations in the Upper Nile regions. Many objects have been unearthed illustrating primitive habits, customs, cults, industries, etc., of Ethiopian man in the stone ages. Large numbers of human remains have been found and studied anthropometrically, anatomically and pathologically.

His deep interest in Africa, an interest especially stimulated by long intimate friendship with the late Sir H. M. Stanley and other African explorers, has been evinced in a very substantial and characteristic fashion, and amongst other things led to the founding of the Lady Stanley Maternity Hospital in 1927. With the sanction and co-operation of the Sudan Government, Sir Henry Wellcome established in 1900 the Wellcome Tropical Research Laboratories at the Gordon Memorial College, Khartoum. This institution has conducted many extremely important and useful investigations into the endemic diseases of tropical Africa, and their relation to bacteriological, entomological and other local conditions. An auxiliary floating laboratory was equipped chiefly for protozoological and proto-entomological research and is used to travel on the Sudan waterways and collect, study, and deal with material on the spot.

The Wellcome Archaeological Research Expedition to the Near East was the outcome of an expedition organized in 1932 to make a preliminary examination of Tell Duweir, Palestine. Sir Henry Wellcome supported the expedition from its inception, thus enabling researches to be conducted without appealing to public funds.

The cause of geographical science, and the exploration and opening up of unknown lands have found in Sir Henry a generous supporter and he has been foremost in rendering practical assistance. Many of the great exploring expeditions of modern times have been medically equipped and financially assisted by him. In connection with the South African War, he bore the entire cost of the medical and surgical equipment of the hospital ship 'Maine'. Among many evidences of his manifold activities during the Great War may be mentioned the presentation to the British Army of a completely equipped motor bacteriological laboratory for use in Egypt and Palestine, and the placing of the

scientific staffs and resources of his research laboratories at the disposal of the Government.

In connection with the Association of Military Surgeons of the United States, Sir Henry founded an annual competition for essays on medico-military subjects, the successful competitors to receive gold and silver medals and substantial money prizes. He also founded History of Medicine Medals and Prizes at Edinburgh University, a gold medal for anthropological research awarded by the Royal Anthropological Institute, and a gold medal awarded periodically by the Royal African Society for distinguished services to Africa.

In the development of missionary enterprise, Sir Henry has taken a keen and persistent interest, and has shown his practical support by equipping mission stations and hospitals in various parts of the world. He bore the entire cost of establishing and equipping the Medical Hospital Dispensary at Mengo in Uganda. In China he founded a Publication Trust Fund under the control and direction of the Chinese Medical Association for the purpose of republishing in the Chinese language standard European and American medical,

surgical and chemical works, so as to educate Chinese medical students in Western methods. Throughout his career he has constantly evinced his warm interest in philanthropic schemes.

In 1936 the President of the French Republic conferred upon Sir Henry the Cross of the Officer of the Legion of Honour. In recognition of his outstanding services to Spanish interests, there was also conferred upon him the decoration of the 'Comendador de la Orden de la República'.

He was created a knight in recognition of his manifold and munificent services to research in medicine and its allied sciences. Sir Henry Wellcome has had numerous honours conferred upon him including the degrees of LL.D., D.Sc., and Hon. F.R.C.S. Eng. In May 1932 the Royal Society unanimously elected Sir Henry a Fellow.

Sir Henry Wellcome passed peacefully away at the age of 82 early in the morning of Saturday, 25th July. His life story might fittingly be called a romance of science and business and has in it more features of interest than it is possible to indicate in this brief sketch.

Current Topics

The Medical Treatment of Peptic Ulcer

By T. I. BENNETT, M.D., F.R.C.P.

(From the *British Medical Journal*, Vol. I, 11th and 18th January, 1936, p. 69 and p. 120)

THE medical treatment of peptic ulcer must needs be long. If the time necessary to secure the permanent healing of a callous ulcer of the leg is considered, it is obvious that a chronic ulcer placed in an actively moving part such as the wall of the stomach or duodenum, and frequently bathed by active digestive ferments, must be a difficult lesion to heal firmly and permanently. When it is also remembered that a peptic ulcer is often present and active without causing any symptoms at all—and, particularly, that a few days of strict treatment will sometimes remove all symptoms—it will be realized that permanent healing requires the collaboration of patient and doctor during a long period, during which neither pain nor discomfort may remind the patient of the necessity for being careful. If only ulcers of the stomach and duodenum remained painful or uncomfortable until they were properly healed, there would be far fewer relapses than occur at present. As it is, it may be said that the medical treatment of peptic ulcer, properly applied over a sufficient period, is extremely satisfactory in all but a small percentage of cases.

From time to time new medical treatments for peptic ulcer appear, the last two to have received much attention being the mucin treatment and the histidine treatment. In this article, however, I will deal with the orthodox lines of medical treatment, which in the hands of many physicians in many countries have yielded excellent results in a high proportion of cases during the last twenty years.

SELECTION OF CASES FOR SURGICAL TREATMENT

There are some cases which from the outset give evidence either that medical treatment will fail or that surgery offers a quicker and simpler road to permanent recovery. Among them the following may be cited:

1. Those in which perforation has occurred.
2. Those in which there has been severe or recurrent dangerous hæmorrhage.

3. Those in which cicatricial contraction has caused, or will soon cause, permanent pyloric stenosis, or serious hour-glass constriction of the stomach.

4. Those in which x-ray examination shows deep ulceration with adhesions to neighbouring structures.

5. Those with a short history or other features pointing to the possibility of malignancy.

6. Those which continue to relapse in spite of efficient medical treatment.

7. Those whose economic position makes effective medical treatment impossible.

Except in the event of perforation, it is possible to argue that surgical treatment is not a necessity in any of the conditions laid down above, and medical treatment, as an alternative to surgery, in these groups will be discussed later. All that is for the moment implied is that in such cases I believe that surgical treatment will yield a higher percentage of good results than will medical treatment.

Medical treatment having been decided upon, the nature of it will be determined by the condition of the patient and the results of x-ray examination. If hæmatemesis or melæna is present there is immediate indication for departure from the ordinary lines of treatment; they will be dealt with later in this article. But apart from bleeding certain symptoms must exercise a decisive effect on the choice of initial treatment, and of these symptoms pain and vomiting are the more important.

WHEN PAIN IS PROMINENT

Severe pain in a case of peptic ulcer indicates that ulceration is very active; but admittedly this conclusion cannot be supported by direct evidence. The mechanism of the pain of peptic ulceration is obscure; it is probably due more to spasm than to the activity of the ulcer. It is a fact, however, that bad pain usually occurs at times when ulceration is very active, and that it is rare for pain to be pronounced at times when an ulcer is quiescent or healing. X-ray examination should never be undertaken during the earliest stages of treatment if pain is present. In the interests of the patient it is necessary to impose a strict régime until such time as pain has disappeared rather than to subject him to the

with salts, vitamins, etc.; but these must be selected from those foods which call for minimum work on the part of the stomach. Fluid foods of high nutritive value are the best of all, and a milk basis here becomes almost essential. There are few walks of life in which it is impossible to obtain a cup of milk, milky coffee, or some similar beverage in the middle of the morning and at tea time. When the gravity of the situation is explained to them, I have found that patients with such varied occupations as those of a Covent Garden porter, a busy practising barrister, a music-hall artist, and a hard-working medical practitioner, were all able, sometimes with the help of a vacuum flask, to take the necessary intermediate snacks without interrupting their work. The main meals present no greater difficulties. The wife or husband of the patient is here the best assistant of the physician, and must be asked to collaborate in securing the proper meals. It has been said that the physical quality of the food is the all-important factor, and it is my custom to lay down that any food which will go into semi-solution in a few minutes if placed in a glass of water, or any food which can easily be crushed through a coarse sieve, is suitable in the diet of a patient with gastric or duodenal ulcer.

The transition from the second to the final stage of treatment must again be gradual, so that four weeks after the beginning of all treatment the patient is following a régime somewhat as follows:

8 a.m.—Belladonna.

8-30 to 9-30 a.m.—One egg, and two very thin, crisp rashers of bacon. Three pieces of thin, crisp toast or three breakfast biscuits, with butter, honey, or red currant jelly. Two cups of milky coffee or tea.

10 a.m.—Alkaline powder.

11 a.m.—Milk or milky coffee.

12 noon.—Alkaline powder.

1 p.m.—4 oz. of boiled or steamed fish. 3 oz. of well-mashed milky potato. Milk pudding, junket, baked custard, or stewed apple with cream.

2-30 p.m.—Alkaline powder.

4-30 p.m.—Two cups of tea with milk and sugar. One slice of sponge cake.

5-30 p.m.—Alkaline powder.

7 to 7-30 p.m.—Omelette or minced chicken. Mashed turnips, purée of peas, vegetable marrow, or well-mashed milky potato. Sweets as at lunch (1 p.m.).

8-30 p.m.—Alkaline powder.

10 p.m.—Hot milk or Ovaltine.

10-30 p.m.—Alkaline powder.

The above régime may be gradually varied by allowing soft foods such as lightly cooked liver or boiled chicken, a grilled cutlet, etc., to be taken occasionally as a substitute for fish. Indeed, a little ingenuity will permit the selection of an entirely palatable and adequate diet provided that the rules as to the consistency and mechanical qualities of the food are always remembered. A close study of the patient's personal habits and occupation must be made in order that the hours of meals may be adjusted to suit him. It is usually necessary to see such patients after they have been back at work for some weeks or months in order to be sure that they are being reasonable as regards the hours of meals and the quality of their food.

ALCOHOL, TOBACCO, AND FORBIDDEN FOODS

Much has been written about the deleterious effect of alcohol and tobacco in cases of peptic ulceration. There is no evidence that alcohol should be prohibited provided that moderation is strictly observed. My custom is to prohibit the taking of either very large drinks or very strong drinks; the bulk of the former is as risky as the strength of the latter. Patients should be informed that one of the risks of alcohol is that, taken before meals, it tends to induce an exaggerated appetite and to cause temptation to exceed reason in the amount of food subsequently eaten. Tobacco is undoubtedly deleterious to anyone with a tendency to peptic ulcer, but so many cases are met with in patients who have never smoked in their lives that it is absurd to say that it is more than an accessory factor. I usually ask patients to give up smoking altogether, and warn them that if they cannot do this they must

remember that anything beyond strict moderation is dangerous.

A list of forbidden foods has the disadvantage of making some people think that anything that is not on the list is all right. The patient should therefore be warned that such a list cannot be inclusive, but merely contains the most dangerous foods. An appropriate list is as follows:

1. All hard raw fruits and vegetables such as nuts, apples, pineapples, pears, lettuce, cucumber, celery, and tomatoes.

2. All really tough or hard cooked fruits and vegetables such as cabbage, carrots, unmashed turnips, new potatoes, stewed pears, pickles.

3. Tough meat, poultry, game, or fish.

4. The less digestible starchy foods such as pastry, fruit cake, new bread, suet puddings, etc.

5. Jams, etc., containing pips and skins. Currants, raisins, and figs.

6. Strong condiments such as vinegar, mustard, curry powder, and chutney.

7. Cheese, with the exception of the lightest forms of cream cheese.

OTHER INDICATIONS FOR MEDICAL TREATMENT

In the presence of the complications referred to at the beginning of this paper, a higher percentage of good results will be obtained by surgical than by medical treatment, but it is common to meet patients with one or other of these complications in whom either there is a physique of poor quality or there is some complicating organic disease such as hypertension, a cardiac lesion, pulmonary tuberculosis, etc., or there is an invincible objection to surgical treatment. For such patients medical treatment is adopted, in spite of the belief that surgical treatment may be indicated.

CASES WITH SOME DEGREE OF OBSTRUCTION

Cases with some degree of gastric, pyloric, or duodenal obstruction will show delay in the emptying of the stomach when examined by x-rays. A residue of barium in the stomach four hours after ingestion is generally accepted as pathological, and it is by no means uncommon to see a case in which such a residue persists even twenty-four hours after the administration of barium. There is another important group of cases of juxtapyloric ulceration in which, although x-ray examination reveals no great delay in emptying, the patient gives a history of periodic attacks of pain and violent vomiting, often occasioned by some emotional disturbance such as a domestic dispute or a slump on the stock exchange. These must be regarded as very early cases of partial gastric obstruction, in which an element of occasional spasm is sufficient to cause temporary obstruction; they call for particular care, because a violent attack may provoke a dangerous hæmorrhage.

It being accepted that surgical treatment is for some reason contra-indicated, cases in the classes referred to must be treated with special precautions. Not only must the initial steps of treatment laid down in the first section of this article be prolonged, but when the final diet is approached it must be realized that it is unlikely that the patient will be able to tolerate some of the foods permitted to cases without obstruction. His final diet must contain plenty of fluid and easily liquefied foods. The partially obstructed stomach tends to become overloaded in the later hours of the day, and therefore the more substantial meals should be at breakfast and lunch, and the evening ones correspondingly diminished.

Alkalosis, characterized by headache, nausea, and vomiting, is particularly apt to occur in patients with pyloric stenosis, and so the amount of alkali should be limited to a small one. It is often better to have recourse to some very mild alkali such as simple prepared chalk. The following is the type of régime often applicable in the final stages of treatment of such cases:

8 a.m.—Belladonna.

9 a.m.—One lightly cooked egg. Two pieces of thin, crisp toast with butter and jelly. Two cups of milky tea or coffee.

risks of perforation and hæmorrhage through the desire for more exact knowledge during this period.

The orthodox and logical treatment of peptic ulcer is to place the patient in such circumstances that the ulcer is as far as possible at rest, and as far as possible freed from the irritation of corrosive gastric juice. On an ordinary diet the normal stomach contracts some 6,000 times daily; by giving small fluid feeds these contractions are reduced by perhaps 80 per cent; by keeping the patient in bed the normal requirements of the body as regards food are reduced to a minimum. Treatment with frequent small fluid feeds and rest in bed are therefore essential at the outset in cases of painful peptic ulceration. Pure gastric juice contains nearly 0.4 per cent of free hydrochloric acid, and this, especially when containing pepsin, constitutes a corrosive fluid calculated grossly to impair the healing of an ulcer. This corrosive action can be minimized by reducing the amount of active gastric juice secreted, by diluting the gastric juice when secreted, or by neutralizing it with alkalis. For this reason the treatment of peptic ulcer includes the administration of fluid foods, such as milk, containing buffer substances, which will adsorb acid, and the administration of mild alkalis, which will neutralize the hydrochloric acid.

Treatment at the outset in a case of gastric or duodenal ulcer in which pain is prominent should therefore be carried out with the patient in bed. Hourly feeds not exceeding three to four ounces should be given, and may be selected from the following list:

Citrated milk. Egg and milk. Milk flavoured with coffee. Arrowroot. Benger's food. Allenbury's food. Ovaltine. Glaxovo. Strained milky vegetable soups.

The last form an agreeable change from the usual milky substances, and it is important that the nature of the feed should be changed from hour to hour in order that the patient may not get too tired of any food. Junket and ice-cream are also permissible even at this early stage.

Belladonna is a very valuable drug for diminishing gastric secretion, but unless given when the stomach is empty it will act only after absorption, and the doses necessary to diminish secretion are then such that unpleasant symptoms may occur, such as dilatation of the pupil. For this reason the administration of belladonna should be in the form of 5 to 7 minims of the tincture in an ounce of water, to be taken when the patient first wakes in the morning; it should not be repeated. During the remainder of the day alkali should be prescribed, but if given after every feed the total amount may be sufficient to cause diarrhœa; it should therefore be taken half an hour after every other feed. The following is the prescription which I have found to be most practicable:

R Mag. carb. pond. one part
Mag. carb. lev. two parts
Cretæ prep. three parts

A small teaspoonful to be taken in water half an hour after every other feed.

If pain is at all severe there is no reason, in the absence of any suspicion of perforation, for withholding opium in some form; and it is indeed advisable to prescribe a mild opiate, because this drug has the advantage of diminishing secretion, although it is not the substance of choice unless pain is present:

R Tinct. chlorof. et morph. co. .. m vij
Aquam ad. 5 ss

A. tablespoonful six-hourly if pain is severe.

After three or four days of treatment on these lines pain has usually disappeared or become much less conspicuous. The opium derivatives should then be omitted, and several of the hourly feeds may be left out, with simultaneous increase of the remaining feeds to 5 or 6 oz. In this manner, at the end of seven to ten days the patient should be taking 6-oz. milky feeds every two hours, with a dose of alkali one hour after each feed from 8 in the morning until 8 in the evening.

THE SECOND STAGE OF TREATMENT

The patient may now be said to have reached the second stage of treatment, by which is meant that pain has practically disappeared, adverse symptoms such as vomiting and bleeding (strong positive tests for occult blood) are absent, and there is reason to suppose that the ulcer is beginning to heal. The patient is taking two-hourly feeds, and small amounts of food may be added to those feeds which more or less correspond to normal meal times. It is a great mistake to work by a fixed diet sheet, because there is so much individual variation between patients, and a new diet sheet usually represents too great an increase from the previous one. Instead, a list should be made showing the total amounts that can be added during this second phase of treatment, the following being an example of such a list:

Thin, crisp, 'oven' toast with butter. Breakfast biscuits or rusks with butter. Honey or red currant jelly. Soft milk puddings, such as rice, tapioca, etc. Two lightly poached or scrambled eggs. Junket, baked custard, ice-cream, stewed apple pulp with whipped cream.

An item or two from this list should be added every two or three days, particularly at breakfast time, lunch time, and supper time. No attempt should be made to advance too quickly, but all the time the patient should be encouraged to realize that steady progress is being maintained. In this way, at the end of about fifteen days, the average patient is following a régime approximately as follows:

8 a.m.—Belladonna.

9 a.m.—One poached egg. Two pieces of thin toast, with butter and a little honey. One cup of milky coffee.

10 a.m.—Alkaline powder.

11 a.m.—Horlick's, Ovaltine, or milky coffee with a little cream.

12 noon.—Alkaline powder.

1 p.m.—8 oz. of strained vegetable soup with crisp toast. 3 oz. of milk pudding.

2-30 p.m.—Alkaline powder.

4 p.m.—Two cups of tea with milk and sugar. One rusk with butter and honey.

5 p.m.—Alkaline powder.

6-30 p.m.—One scrambled egg. Two pieces of thin, crisp toast and butter. Ice-cream.

7-30 p.m.—Alkaline powder.

9 p.m.—Glass of hot milk or Ovaltine.

10 p.m.—Alkaline powder if awake.

At this stage the patient should be getting up daily, but not going out of his house.

FINAL STAGE OF TREATMENT

The average course of treatment in uncomplicated cases should include about three weeks' strict treatment at home, three weeks' 'convalescent' treatment, and three further weeks during which the patient is doing light work before resuming full work on a well-regulated diet.

When the final stage of treatment is reached it is essential to make a close study of the normal habits of each patient. It is absurd to lay down the same laws for the bank clerk, the labourer, the actor, the professional footballer, the market gardener, and the society woman. Obviously the hours of activity and the food requirements of these people will vary enormously. I am, however, convinced from experience that two factors are of predominant importance in deciding success in the treatment of all these cases. The first is the time of meals and the second the physical quality of the food. As regards the time of meals, these must be so spaced that the stomach is never very full and never empty of everything save corrosive gastric juice. In all classes of patients an attempt should be made to secure three light main meals a day, with a snack in the middle of the morning, between lunch and dinner, and in the late evening.

As to the nature of the food it must clearly contain the essentials for proper nutrition—that is to say, adequate amounts of carbohydrate, protein, and fat,

with salts, vitamins, etc.; but these must be selected from those foods which call for minimum work on the part of the stomach. Fluid foods of high nutritive value are the best of all, and a milk basis here becomes almost essential. There are few walks of life in which it is impossible to obtain a cup of milk, milky coffee, or some similar beverage in the middle of the morning and at tea time. When the gravity of the situation is explained to them, I have found that patients with such varied occupations as those of a Covent Garden porter, a busy practising barrister, a music-hall artist, and a hard-working medical practitioner, were all able, sometimes with the help of a vacuum flask, to take the necessary intermediate snacks without interrupting their work. The main meals present no greater difficulties. The wife or husband of the patient is here the best assistant of the physician, and must be asked to collaborate in securing the proper meals. It has been said that the physical quality of the food is the all-important factor, and it is my custom to lay down that any food which will go into semi-solution in a few minutes if placed in a glass of water, or any food which can easily be crushed through a coarse sieve, is suitable in the diet of a patient with gastric or duodenal ulcer.

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10 a.m.—Alkaline powder.

11 a.m.—Milk or milky coffee.

12 noon.—Alkaline powder.

1 p.m.—4 oz. of boiled or steamed fish. 3 oz. of well-mashed milky potato. Milk pudding, junket, baked custard, or stewed apple with cream.

2-30 p.m.—Alkaline powder.

4-30 p.m.—Two cups of tea with milk and sugar. One slice of sponge cake.

5-30 p.m.—Alkaline powder.

7 to 7-30 p.m.—Omelette or minced chicken. Mashed turnips, purée of peas, vegetable marrow, or well-mashed milky potato. Sweets as at lunch (1 p.m.).

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3. Tough meat, poultry, game, or fish.

4. The less digestible starchy foods such as pastry, fruit cake, new bread, suet puddings, etc.

5. Jams, etc., containing pips and skins. Currants, raisins, and figs.

6. Strong condiments such as vinegar, mustard, curry powder, and chutney.

7. Cheese, with the exception of the lightest forms of cream cheese.

OTHER INDICATIONS FOR MEDICAL TREATMENT

In the presence of the complications referred to at the beginning of this paper, a higher percentage of good results will be obtained by surgical than by medical treatment, but it is common to meet patients with one or other of these complications in whom either there is a physique of poor quality or there is some complicating organic disease such as hypertension, a cardiac lesion, pulmonary tuberculosis, etc., or there is an invincible objection to surgical treatment. For such patients medical treatment is adopted, in spite of the belief that surgical treatment may be indicated.

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It being accepted that surgical treatment is for some reason contra-indicated, cases in the classes referred to must be treated with special precautions. Not only must the initial steps of treatment laid down in the first section of this article be prolonged, but when the final diet is approached it must be realized that it is unlikely that the patient will be able to tolerate some of the foods permitted to cases without obstruction. His final diet must contain plenty of fluid and easily liquefied foods. The partially obstructed stomach tends to become overloaded in the later hours of the day, and therefore the more substantial meals should be at breakfast and lunch, and the evening ones correspondingly diminished.

Alkalosis, characterized by headache, nausea, and vomiting, is particularly apt to occur in patients with pyloric stenosis, and so the amount of alkali should be limited to a small one. It is often better to have recourse to some very mild alkali such as simple prepared chalk. The following is the type of régime often applicable in the final stages of treatment of such cases:

8 a.m.—Belladonna.

9 a.m.—One lightly cooked egg. Two pieces of thin, crisp toast with butter and jelly. Two cups of milky tea or coffee.

It does not seem possible that as lasting a cure is to be obtained from histidine as from any other form of medical treatment for chronic ulcer similar to those in the cases recorded, but it is a form of treatment which I found gave satisfaction to both patient and physician.

Histidine Hydrochloride *versus* Diet and Alkalis in Treatment of Peptic Ulcer

By K. A. MARTIN, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CVI, 25th April, 1936, p. 1468)

METHOD EMPLOYED IN THE PRESENT STUDY

EIGHTY-ONE patients with active symptoms of peptic ulcer and positive radiologic evidence were chosen from

TABLE I.—Immediate and late effects from histidine treatment in peptic ulcer: forty-one cases

	SYMPTOM FREE			CRATER OR PERSISTENT SYMPTOMS		
	Ulcer healed (x-ray)	Ulcer not healed (x-ray)	Total cases	Crater		Persistent or recurring symptoms
				Before treatment	After treatment	
Immediate results at completion of injections.	14	12	30	33	22	11
Late results, from 6 to 12 months.	10	3	13*	..	..	26
Patients operated on.	..	..	..	..	..	4

* Trace lost of two of these patients.

our clinic for this study. They were allotted impartially to one of two groups: (1) the histidine group and (2) the diet-alkali or control group.

Selection of patients.—We considered the selection of patients of the utmost importance. The requirements of the study did not permit the selection of more than one in ten of the ulcer patients who came to the clinic. The patient's close residence to the clinic, his intelligence and co-operation, and his willingness to undertake such a time-consuming procedure were important factors. All the eighty-one patients were kept ambulatory and at their usual work, with the exception of three in the histidine series who were hospitalized because of the acuteness of their symptoms at the beginning of their treatment. Fairly young individuals in whom there were no concomitant organic diseases to obscure the clinical picture were given preference. All the cases selected were confirmed radiographically and in most instances a crater was visualized. More patients with duodenal ulcer than gastric ulcer were included because of the greater frequency and the chronicity of the former and the tendency of the latter to disappear, leaving no trace,

regardless of the therapy used. No attempt was made to limit the ratio of the female to the male patients. The evidence presented suggested that the duration of the ulcers in this group varied from one to seven years. It is unusual in a large clinic to find a patient seeking relief for his ulcer symptoms who does not give a history indicating that his ulcer has existed for at least a year and in most instances for several years. It is also the rule rather than the exception that these patients have had one or more 'medical cures' even though a positive diagnosis may not have been made before coming under our observation. Chronicity and rhythmicity are the rule and not the exception.

I do not wish to convey the impression that the patients chosen for this study were those with deep calloused ulcers, amenable only to surgical intervention. On the contrary, they were a medium young group with no demonstrable disease other than duodenal or gastric ulcers, and with acute symptoms that would be expected to react favourably to the usual diet-alkali regimen.

Management of patients.—Patients of both groups were examined and treated in the routine way to eliminate as far as possible extrapsychogenic factors. They were examined by the various members of the staff; the daily injections were given by the nursing staff to those in the histidine group; the radiographic examinations were carried out by the regular staff of that department without knowledge as to which patients were included in this study.

HISTIDINE SERIES

There were forty-one patients in this group, thirty-two men and nine women. Thirty-eight had duodenal ulcer, two gastric ulcer and one marginal ulcer. Their ages ranged from 18 to 62 years, averaging 37 years. The histidine (4 per cent aqueous, isotonic histidine hydrochloride) was given intramuscularly in 5 c.c. doses daily (omitting Sundays) for from twenty to twenty-four days. The diet and medication were those on which the patients had previously been placed, in our clinic, elsewhere or by themselves. In most instances they were found to be on a high calorie, low residual diet with little or no medication. It was deemed advisable to make no changes, as far as possible, in their diet or medication while they were under observation. Six of these patients were first given 5 c.c. of physiologic solution of sodium chloride for six days and then switched to histidine injections without their knowledge of the change.

Results.—The immediate and sustained effect of histidine on this group can best be demonstrated in table I.

At the completion of the injection.—Thirteen of the forty-one cases showed a decreased gastric acidity, twenty showed an increased gastric acidity, and one showed no change in gastric acidity. For one reason or another, this procedure could not be carried out on seven of the forty-one patients. Twenty-six of the patients gained weight, five lost weight and ten showed no change. The gain in weight was in most instances in direct ratio to the relief of symptoms and the increased caloric intake.

The relief of symptoms, when it occurred, usually appeared early in the treatment, at about the fifth to the seventh injection. It was not uncommon for the patient to experience a moderate increase of gastric distress after the injections had been started and just before obtaining relief from symptoms. No other local or systemic reaction was noted. Three of the six patients receiving saline injections became symptom free before the histidine was started.

In thirty-three of the forty-one cases there was radiologic evidence of a crater before treatment; in twenty-two, the evidence persisted after treatment. In one case a crater was demonstrated after treatment when it had been demonstrated before. Fourteen were

ulcer. Twelve were symptom free and showed radiologically that the ulcer was not healed. Eleven had persistent symptoms and gave radiologic evidence of healed ulcer. Four of these eleven patients have since been operated on, one for a marginal ulcer, one for a medium-sized gastric ulcer, and two for duodenal ulcer; of the latter, one patient had persistent pain and one repeated hemorrhages. Two patients have refused operation that was advised because of the radiologic and clinical evidence. The five remaining patients showed nothing unusual in the radiologic or physical examination. However, two of them have been unable to solve their matrimonial difficulties; another is a young ambitious actor who has been unemployed for two years and has had recurring attacks of pain; a fourth, a man aged 56, who before 1929 had an excellent income, now finds himself unable to make adjustments to a meagre wage, and the last, a young man, an electrician, unemployed for one and a half years, lost

TABLE II.—Immediate and late effect from the diet-alkali ambulatory regimen in peptic ulcer: forty cases

	Symptom free	Crater before treatment	Persistent or recurring symptoms
Immediate results (at end of 4 weeks)	31	35	9
Late results, from 10 to 12 months	16	..	24
Patients operated on	..	..	3

a 6-year-old daughter with septicemia in 1932 and a second, aged 4 years, following an acute mastoiditis in 1934.

Follow up.—The period of time that has elapsed since the completion of the injections varies from six months to one year. Thirty-two patients have been under observation over ten months. Of the thirty patients rendered symptom free by this regimen, there are at this time thirteen still symptom free. Twenty-six patients have had one or more relapses, and two patients have been lost.

It is interesting to note in which group the largest number of relapses occurred. Of the twelve cases presenting a persistent crater but symptom free, only three have remained asymptomatic, whereas of the fourteen cases rendered symptom free and in which no crater could be demonstrated after treatment, ten have remained asymptomatic.

CONTROL SERIES: DIET-ALKALI REGIMEN

There were forty patients in the control series, thirty-six men and four women. Thirty-seven had duodenal ulcers and three gastric ulcers. A crater was demonstrated in thirty-five of the forty cases. The ages of this group ranged from 19 to 64, averaging 39 years. They received the alkali therapy, and ambulatory diet of five feedings a day which is routine in our outpatient clinic as well as in many clinics elsewhere.

Results.—At the end of the first month of treatment or period corresponding to the completion of the histidine treated group, thirty-one of these patients were symptom free. Three of the remaining patients have since been operated on. The time that has elapsed since these patients were placed on a five-feeding, alkaline, ambulatory regimen varies from ten months to one year. Up to the present time, sixteen have remained symptom free, whereas twenty-four have had one or more relapses.

Rat-Bite Fever Spirochaetes in Naturally Infected White Mice, *Mus musculus*

By E. FRANCIS

(From *Public Health Reports, Washington*, Vol. LI, 17th July, 1936, p. 976)

DARK-FIELD examination of human material for rat-bite fever may fail to demonstrate the spirochaetes, but when such material is injected into white mice, white rats, or guinea-pigs, multiplication may render the organisms readily visible by dark-field examination of the animal's blood. The white mouse is the most susceptible experimental animal for this organism; but caution is necessary when using white mice, as the animals may be already naturally infected.

Robertson has made the only reference which I have seen in the literature to natural infection of white mice. He states that, on four occasions since 1924, he has discovered spontaneous infection of rat-bite fever in laboratory mice which were either stock animals or were carrying some other parasite (*Trypanosoma cruzi* or *Treponema recurrentis*).

I had an experience similar to that of Robertson. On 19th December, 1935, and again on 20th December, a stock white mouse was allowed to ingest 2 dozen living bed bugs immediately after they had fed to engorgement on a mouse whose blood was rich in relapsing fever spirochaetes. On 21st December his blood showed a heavy infection with rat-bite fever spirochaetes, but he did not become positive for relapsing fever spirochaetes until 22nd December. This suggested an examination of the remaining stock mice, of which there were only 8; 6 of these were found infected with rat-bite spirochaetes by dark-field examination of the tail blood.

Subsequent examination was made of samples of each lot of fresh white mice as they were furnished to the National Institute of Health by four dealers. Tests indicated that three of the dealers were supplying mice free from this infection; but on 14th April, 1936, of 150 white mice received from the fourth dealer, 45 were found infected with rat-bite spirochaetes by dark-field examination of tail blood, and 105 were negative.

A single preparation was made from each mouse and about 10 minutes were devoted to its examination, using a high-dry objective, without funnel stop, and a dark-field substage condenser. The numbers of spirochaetes per single preparation of 45 positive mice were 31, 30, 52, 14, 30, 6, 20, 40, 60, 15, 1, 3, 15, 21, 2, 60, 10, 25, 3, 26, 20, 10, 10, 8, 3, 30+, 27, 30+, 10, 9, 12+, 5, 11, 30+, 4, 29+, 13, 14, 11, 3, 28+, 21, 3, 25+, and 23.

Between 14th April and 22nd June, 1936, a second examination was made of the 105 mice which were negative on the first examination but which were kept together in one lot. Of these, 20 were found infected, the number of spirochaetes per single dark-field preparation of 20 positive white mice being 5, 9, 19, 8, 50, 25, 70+, 45+, 70+, 10, 30, 70, 60+, 17, 19, 5, 26, 28, 5, and 6. This second examination demonstrates how misleading a single examination may be, and how rapid the spread of infection may be in a lot of white mice known to be infected.

The term 'jobber' is more appropriate for the fourth dealer because he did not maintain a stock of breeders but bought his mice in small numbers from various miscellaneous individuals in Pennsylvania.

Trained bacteriologists may fail to recognize the rat-bite spirochaete when seen for the first time in the dark field. The eye which is trained to the form and movements of *Treponema pallidum* may readily overlook a typical rat-bite spirochaete, mistaking it for a motile darting bacillus, especially when the preparation is freshly made or when the organisms are few. After the preparation has stood for perhaps half an hour, the slowed movements permit the spiral form and terminal flagellum at each end to be plainly seen.

The lesson is obvious that before inoculating from a patient to white mice one should be sure that his mice

10 a.m.—A teaspoonful of prepared chalk with water.
11 a.m.—A cup of some milky feed, with a sweet biscuit.

12 noon.—Powder as before.

1 p.m.—Soft fish, minced chicken, or a soufflé. A small helping of well-mashed milky potato. Milk pudding, junket, baked custard, or ice-cream.

2-30 p.m.—Powder.

4 p.m.—Tea, with sponge cake.

6 p.m.—Powder.

7-30 p.m.—A bowl of milky soup with crisp, thin toast; or two poached or scrambled eggs; or steamed plaice with one slice of crisp toast and a glass of milk.

9 p.m.—Powder.

10 p.m.—A cup of some hot milky feed.

Many patients with a considerable degree of pyloric stenosis have been kept in good health for years on a régime such as this. The older the patient and the more sedentary his habits the more likely are good results to attend such treatment, but I have seen it successful many times, and even in some instances among labourers of the poorest class. It is clear that most careful education of the patient is necessary if such success is to be obtained; the exact condition of his stomach must be made clear, and the grave risks of perforation and hæmorrhage impressed upon him. When this has been done, and he realizes that the treatment is a difficult alternative to surgical operation, he will often collaborate in a most satisfactory manner; without such intelligent and willing collaboration failure is almost certain to follow.

DEEP ULCERATION AND ADHERENCE TO NEIGHBOURING STRUCTURES

This is perhaps the commonest class of case in which surgery is the more desirable type of treatment, but it must be recognized that the operation is usually a very serious one, and that the low mortality achieved by the great gastric surgeons is a tribute to their personal skill and in no way suggests that the operation is of minor character. The resection of a considerable portion of the stomach is the most useful treatment, and many patients are encountered who prefer to face the very possible failure of medical treatment over a long period rather than to risk an operation. In justice to himself the practitioner must explain the situation very carefully to the patient, after which medical treatment should proceed either on the lines laid down in the early part of this paper or by means of duodenal feeding. If the usual method of oral feeds and alkalis is adopted all food must be kept fluid for at least a month, although the size of the feeds, there being no gastric obstruction, must be sufficient to secure a diet of a total calorie value of 2,000 a day. Duodenal feeding has achieved some brilliant successes in cases of this type, and presents little difficulty when carried out in a nursing home or institution. The majority of patients do not find it unpleasant after the first few days.

When this line of treatment is adopted careful x-ray examination should be carried out once a month, in order that the condition of the ulcer may be noted, and still be continued for a long time, in view of the very chronic nature of such lesions.

SUSPECTED MALIGNANCY

Patients are not infrequently seen with symptoms suggestive of peptic ulceration, but with a history so short that the suspicion of malignancy arises. When, in such cases, the radiologist finds a large ulcer of somewhat atypical appearance this suspicion is often increased. It now becomes a most difficult matter to decide on the right lines of treatment; should the ulcer be a malignant one the only possibility of saving the patient's life lies in surgical intervention, whilst if the ulcer is non-malignant it will probably heal with effective medical treatment, and the patient will then be left in a better position than if an extensive resection of the stomach has been performed. The treatment adopted will depend largely on the personal feelings of the patient and his immediate medical adviser.

Obviously a mere whisper of the word 'cancer' will be sufficient to make the patient turn towards surgery, and this makes the decision even more difficult. In view of the very bad prognosis which still attaches to all examples of cancer of the stomach there is perhaps sound reason to argue: 'If this patient has cancer the chances of cure are remote, if he has a simple ulcer the chances of cure by purely medical means are excellent'. Those to whom this argument appeals will accordingly adopt medical treatment on the lines laid down above. This is not the place to discuss this problem further, but it should be added that the decision must be faced and made firmly, in one direction or the other, and acted on without delay.

OTHER DIFFICULT CASES

It has been said that surgery should be adopted in all cases which continue to relapse in spite of efficient medical treatment. Such cases, unless attended by one of the complications dealt with above, are rare. In my experience I seldom encounter a case of simple gastric or duodenal ulcer, even when the history goes back for ten or fifteen years, in which the medical treatment previously adopted has been such that I should have expected it to cure the patient and prevent relapse. It is particularly the prevention of relapse that is neglected, and this can only be done when the practitioner in charge arranges for the periodic revision of each case, in order to see that gross foci of sepsis are avoided and that the patient's dietetic routine, when at work, is sensible in character. It is only when this has been carried out, and it can be shown that the patient relapses in spite of reasonable care on his own part and in spite of wise guidance by his medical attendant, that uncomplicated cases of peptic ulcer should be treated surgically rather than medically.

Histidine in the Treatment of Gastric and Duodenal Ulcer

By R. H. GARDINER, M.B. (Oxon.)

(From the *Lancet*, Vol. I, 13th June, 1936, p. 1352)

DURING the months August to December 1935, twelve consecutive cases of gastric and duodenal ulcer admitted to the Grimsby and District Hospital were submitted to a new routine treatment in order to test the value of histidine as a curative agent.

TREATMENT

On admission, if radiography with barium meal, and if a fractional test-meal, in conjunction with the gastric history and symptoms, pointed to the presence of an ulcer, the histidine treatment was carried out as follows:—

A light solid diet with meals at the usual time was given. Patients were encouraged to take exercise on the ward balcony daily, and they were not confined to bed, being allowed up in the ward. Smoking in moderation was not prohibited.

Daily intramuscular injections of 5 c.cm. of larostidin were given into the buttocks, 25 injections being given in all. Small doses of alkalis were prescribed at the beginning of the course when there was pain after meals, but were rarely necessary after the tenth day. At the end of the course control radiograms and fractional test-meals were repeated. All the patients treated were men of the labouring class. The whole course averaged a month. The series of 12 cases are recorded in the table, with a brief history, the diagnosis, and the results obtained.

RESULTS

Symptomatic relief was obtained in all cases, and there was an invariable fall in gastric acidity. Of 9 cases followed up 6 were fit and well after 4 to 6 months, whilst in 3 there had been a return of symptoms.

ADVANTAGES

Compared with the ordinary medical treatment for ulcers—namely, four weeks in bed on a graduated diet—the new treatment has the following advantages. It is far more congenial to the patient whose only inconvenience is the daily injection. There is no irksome diet of ten days of citrated milk and a graduated diet with prolonged confinement in bed. The treatment is also far simpler, with less trouble to the nursing staff, and the time taken is slightly less than the diet treatment.

CONCLUSIONS

Results obtained in the series show at least a temporary loss of symptoms comparable with those obtained by ordinary medical treatment. It is doubtful if histidine has any healing effect on the ulcer directly, its action probably being a reduction in gastric acidity and a lowering of gastric motility. The ulcer has

therefore a chance to heal, as the irritative factors are removed with a consequent loss of symptoms. Although not actually confined to bed the patients were not performing the heavy work to which they were accustomed and this also no doubt aided recovery.

There are distinct possibilities for this form of treatment, particularly among sedentary workers. An ambulatory treatment of ulcer could be carried out while they perform their usual daily routine, thus avoiding in many cases the loss of time of an enforced rest of over a month. The course of injections can be repeated if there should be an exacerbation.

Compared with the dietetic method, the cost of treating ulcers on the above lines was found to be about the same or a little less, since the average time taken in hospital was shorter, which helped to balance the cost of the larostidin. To the patient, however, it was a saving, for a normal life could be entered upon as soon as the course was finished, without the necessity of a convalescence period.

HISTORY, DIAGNOSIS AND RESULTS OF HISTIDINE TREATMENT

No.	Age	Date of admission: symptoms	Findings	Condition at end of treatment	Condition on 1st April, 1936
1	40	12th August, 1935: Pain 2 hours after food, severe at night; anæmia.	Duodenal ulcer.	Cured.	No pain; very fit indeed.
2	32	25th November: Persistent 'gastric' trouble for years, with treatment; very little freedom.	Gastric ulcer; very high gastric acidity.	Complete relief.	One month's freedom, but pain has returned.
3	43	12th August: Very severe epigastric pain for 10 weeks, typical of gastric ulcer.	Large gastric ulcer on lesser curvature.	No symptoms except for occasional water-brash. Ulcer still found in radio-grams.	Very fit; eats anything. No indigestion or pain.
4	69	17th October: Years of gastric trouble with loss of weight, and pain 2½ hours after food.	Duodenal ulcer.	Much better.	Pain returned 1 week ago but not so severe as before.
5	32	8th August: 'Acute indigestion' 6 months, with pain 2 hours after food.	Pyloric ulcer; high gastric acidity with climbing curve in test-meal.	Cured, but high resting acidity remained.	..
6	27	16th December: Severe pain 20 minutes, after food, with acid eructations. Anæmic.	Gastric ulcer.	Symptoms cured.	No further trouble.
7	45	15th October: Pain 4 hours after food. Melæna.	Duodenal ulcer.	Symptoms cured.	..
8	43	16th December: Persistent pain after food; sudden onset and melæna.	'Hour-glass' stomach; high acidity with climbing curve. Pyloric ulcer.	Better.	..
9	38	25th November: 8 years, symptoms of duodenal ulcer.	Duodenal ulcer with high acidity.	Cured.	Gained 1 stone in weight. No further trouble.
10	50	30th September: Years of epigastric pain, always ½ hour after food; two hæmatemeses.	Pyloric ulcer; high climbing curve, gastric acidity.	Better.	Pain now as bad as ever.
11	49	2nd September: Pain ½ hour after food, with persistent nausea.	Gastric ulcer.	Symptoms cured; ulcer not seen in radiograms.	Very fit indeed.
12	68	12th November: Admitted as emergency with hæmatemesis; long history of gastric trouble.	Gastric ulcer; hæmatemesis treated on usual lines, followed by larostidin; very high gastric acidity.	Symptoms cured; gain in weight.	No further trouble.

It does not seem possible that as lasting a cure is to be obtained from histidine as from any other form of medical treatment for chronic ulcer similar to those in the cases recorded, but it is a form of treatment which I found gave satisfaction to both patient and physician.

Histidine Hydrochloride *versus* Diet and Alkalis in Treatment of Peptic Ulcer

By K. A. MARTIN, M.D.

(Abstracted from the *Journal of the American Medical Association*, Vol. CVI, 25th April, 1936, p. 1468)

METHOD EMPLOYED IN THE PRESENT STUDY

EIGHTY-ONE patients with active symptoms of peptic ulcer and positive radiologic evidence were chosen from

TABLE I.—Immediate and late effects from histidine treatment in peptic ulcer: forty-one cases

	SYMPTOM FREE			CRATER OR PERSISTENT SYMPTOMS		
	Ulcer healed (x-ray)	Ulcer not healed (x-ray)	Total cases	Crater		
				Before treatment	After treatment	Persistent or recurring symptoms
Immediate results at completion of injections.	14	12	30	33	22	11
Late results, from 6 to 12 months.	10	3	13*	..	..	26
Patients operated on.	..	..	..	..	..	4

* Trace lost of two of these patients.

our clinic for this study. They were allotted impartially to one of two groups: (1) the histidine group and (2) the diet-alkali or control group.

Selection of patients.—We considered the selection of patients of the utmost importance. The requirements of the study did not permit the selection of more than one in ten of the ulcer patients who came to the clinic. The patient's close residence to the clinic, his intelligence and co-operation, and his willingness to undertake such a time-consuming procedure were important factors. All the eighty-one patients were kept ambulatory and at their usual work, with the exception of three in the histidine series who were hospitalized because of the acuteness of their symptoms at the beginning of their treatment. Fairly young individuals in whom there were no concomitant organic diseases to obscure the clinical picture were given preference. All the cases selected were confirmed radiographically and in most instances a crater was visualized. More patients with duodenal ulcer than gastric ulcer were included because of the greater frequency and the chronicity of the former and the tendency of the latter to disappear, leaving no trace,

regardless of the therapy used. No attempt was made to limit the ratio of the female to the male patients. The evidence presented suggested that the duration of the ulcers in this group varied from one to seven years. It is unusual in a large clinic to find a patient seeking relief for his ulcer symptoms who does not give a history indicating that his ulcer has existed for at least a year and in most instances for several years. It is also the rule rather than the exception that these patients have had one or more 'medical cures' even though a positive diagnosis may not have been made before coming under our observation. Chronicity and rhythmicity are the rule and not the exception.

I do not wish to convey the impression that the patients chosen for this study were those with deep calloused ulcers, amenable only to surgical intervention. On the contrary, they were a medium young group with no demonstrable disease other than duodenal or gastric ulcers, and with acute symptoms that would be expected to react favourably to the usual diet-alkali regimen.

Management of patients.—Patients of both groups were examined and treated in the routine way to eliminate as far as possible extrapsychogenic factors. They were examined by the various members of the staff; the daily injections were given by the nursing staff to those in the histidine group; the radiographic examinations were carried out by the regular staff of that department without knowledge as to which patients were included in this study.

HISTIDINE SERIES

There were forty-one patients in this group, thirty-two men and nine women. Thirty-eight had duodenal ulcer, two gastric ulcer and one marginal ulcer. Their ages ranged from 18 to 62 years, averaging 37 years. The histidine (4 per cent aqueous, isotonic histidine hydrochloride) was given intramuscularly in 5 c.c. doses daily (omitting Sundays) for from twenty to twenty-four days. The diet and medication were those on which the patients had previously been placed, in our clinic, elsewhere or by themselves. In most instances they were found to be on a high calorie, low residual diet with little or no medication. It was deemed advisable to make no changes, as far as possible, in their diet or medication while they were under observation. Six of these patients were first given 5 c.c. of physiologic solution of sodium chloride for six days and then switched to histidine injections without their knowledge of the change.

Results.—The immediate and sustained effect of histidine on this group can best be demonstrated in table I.

At the completion of the injection.—Thirteen of the forty-one cases showed a decreased gastric acidity, twenty showed an increased gastric acidity, and one showed no change in gastric acidity. For one reason or another, this procedure could not be carried out on seven of the forty-one patients. Twenty-six of the patients gained weight, five lost weight and ten showed no change. The gain in weight was in most instances in direct ratio to the relief of symptoms and the increased caloric intake.

The relief of symptoms, when it occurred, usually appeared early in the treatment, at about the fifth to the seventh injection. It was not uncommon for the patient to experience a moderate increase of gastric distress after the injections had been started and just before obtaining relief from symptoms. No other local or systemic reaction was noted. Three of the six patients receiving saline injections became symptom free before the histidine was started.

In thirty-three of the forty-one cases there was radiologic evidence of a crater before treatment; in twenty-two, the evidence persisted after treatment. In one case a crater was demonstrated after treatment when it had not been demonstrated before. Fourteen were symptom free and showed radiologic evidence of healed

ulcer. Twelve were symptom free and showed radiologically that the ulcer was not healed. Eleven had persistent symptoms and gave radiologic evidence of healed ulcer. Four of these eleven patients have since been operated on, one for a marginal ulcer, one for a medium-sized gastric ulcer, and two for duodenal ulcer; of the latter, one patient had persistent pain and one repeated hemorrhages. Two patients have refused operation that was advised because of the radiologic and clinical evidence. The five remaining patients showed nothing unusual in the radiologic or physical examination. However, two of them have been unable to solve their matrimonial difficulties; another is a young ambitious actor who has been unemployed for two years and has had recurring attacks of pain; a fourth, a man aged 56, who before 1929 had an excellent income, now finds himself unable to make adjustments to a meagre wage, and the last, a young man, an electrician, unemployed for one and a half years, lost

TABLE II.—Immediate and late effect from the diet-alkali ambulatory regimen in peptic ulcer: forty cases

	Symptom free	Crater before treatment	Persistent or recurring symptoms
Immediate results (at end of 4 weeks).	31	35	9
Late results, from 10 to 12 months.	16	..	24
Patients operated on.	..	..	3

a 6-year-old daughter with septicæmia in 1932 and a second, aged 4 years, following an acute mastoiditis in 1934.

Follow up.—The period of time that has elapsed since the completion of the injections varies from six months to one year. Thirty-two patients have been under observation over ten months. Of the thirty patients rendered symptom free by this regimen, there are at this time thirteen still symptom free. Twenty-six patients have had one or more relapses, and two patients have been lost.

It is interesting to note in which group the largest number of relapses occurred. Of the twelve cases presenting a persistent crater but symptom free, only three have remained asymptomatic, whereas of the fourteen cases rendered symptom free and in which no crater could be demonstrated after treatment, ten have remained asymptomatic.

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Between 14th April and 22nd June, 1936, a second examination was made of the 105 mice which were negative on the first examination but which were kept together in one lot. Of these, 20 were found infected, the number of spirochaetes per single dark-field preparation of 20 positive white mice being 5, 9, 19, 8, 50, 25, 70+, 45+, 70+, 10, 30, 70, 60+, 17, 19, 5, 26, 28, 5, and 6. This second examination demonstrates how misleading a single examination may be, and how rapid the spread of infection may be in a lot of white mice known to be infected.

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The lesson is obvious that before inoculating from a patient to white mice one should be sure that his mice

are free from natural infection, or he should avoid the use of white mice in favour of white rats and guinea-pigs. In the case reported by Francis inoculation was made from the patient's lymph node to a white rat and then to guinea-pigs for three generations.

[Note.—The writer of this paper does not appear to have seen the article in our April number on the same subject. We reproduce this note to show how world-wide is the *Spirillum minus* infection in white mice. That this observation has not been made before suggests that hitherto adequate controls have not been used when using mice for diagnosing rat-bite fever.—EDITOR, I. M. G.]

The Physiological Basis for the Modern Treatment of Fractures

By A. L. d'ABREU, M.B., F.R.C.S.

(From the *Medical Press and Circular*, Vol. CXCII, 1st April, 1936, p. 299)

AN apparent revolution has occurred in the modern treatment of recent fractures, for the number of such cases referred to massage departments has shown a marked decline in this country, on the Continent, and in Australia. Many fractures are now treated without a single day's massage or without a single passive movement. Coincidentally with this change, a marked decrease in the periods of incapacity of injured workmen and an enormous reduction in the number of hospital attendances by such cases has occurred. Compensation fees and lost wages have shown a similar saving. This paper is an attempt to explain the physiological principles underlying the 'new treatment'.

There is nothing obscure or mysterious about the healing of a fracture. Bone is a living connective tissue impregnated with active calcium salts and compounds which can be converted readily into a diffusible form; the hard tissue is under the influence of hormones, especially those of the parathyroid glands and of its own blood supply; if the blood supply or the amount of parathyroid secretion exceed normal limits, then inevitably decalcification occurs. Such decalcification occurs in generalized osteitis fibrosa cystica where parathyroid activity is greatly increased; more commonly and more importantly does it occur in hyperæmic conditions of bone due to trauma, especially where it is rapidly and regularly repeated, in acute infections, in the presence of active tuberculosis (a disease invariably accompanied by increased vascularity), or when bone is involved by vascular new growths. If, on the other hand, the blood supply to a bone is gradually decreased as in the endarteritis obliterans of syphilis, or by the fibrosis that succeeds healing in fractures or in acute osteomyelitis, or in healing tuberculous lesions around joints, then increased density or sclerosis of bones occurs.

When these facts (for such they are, and not opinions) are applied to the problem of bone healing in fractures, they are simplicity itself. Between and around fractured bone ends a hæmatoma rapidly forms which in time becomes organized into fibrous tissue, which in turn becomes impregnated with calcium derived from local sources and from the circulating blood. As the fibrous tissue becomes older its connective tissue cells become less plump, and as in scars elsewhere, this is succeeded by gradual contraction whereby the local blood vessels are in part, or in whole, obliterated; in the case of bone scars this leads to increased calcification, as can be readily witnessed in the case of hæmatomata under the sub-periosteal space of the subcutaneous surface of the tibia; such blood clots eventually become organized into notes of calcified tissue easily demonstrable on the radiograph. This simplified view of bone repair as a process of calcification occurring in living connective tissue enables us to regard the high sounding 'osteoblast' merely as a plump connective tissue cell, while the 'osteoclast' is nothing more than a scavenging cell, or macrophage, which completes the task of re-calcification by removing

any unwanted tissue, whether it be fibrous, calcareous or fibrinous. This view of bone formation occurring as a biochemical or 'humoral' process rather than as a mysterious process depending on specially selective bone cells or osteoclasts has been described in great detail by Leriche and Policard. A fuller description of it would be out of place in this paper.

THE INFLUENCE OF THESE PHYSIOLOGICAL FACTS UPON THE MANAGEMENT OF FRACTURE CASES

If the bone ends of a recent fracture are maintained in careful approximation, hæmatoma formation will be reduced to a minimum, fibrous tissue will permeate the clot knitting the fractured surfaces together, and after the inevitable contraction has occurred to cause a relative ischæmia, calcium deposition will follow. Adequate healing with minimum callus formation will then take place. What will occur if, instead of providing rigid immobilization to such fractured surfaces, we allow movement to take place, or, worse still, if we deliberately have them passively moved by the masseur? Clearly, repeated trauma will be inflicted upon tissue that is already injured and inflamed; inflamed because we define inflammation as 'the response of living tissue to injury'. These repeated injuries, by causing inflammation, will lead to an increase in vascularity; such hyperæmia will not only delay calcification, but will actually cause decalcification, so that the gap between the bone ends will increase. Such a gap may become so wide that eventually the fragments do not touch each other. The traumatic inflammation slowly subsides, the bone ends are covered by fibrous tissue contracting, which gradually lessens the blood supply to the stumps so that dense sclerosis occurs with a gap between the fragments, and non-union is present.

Such a train of events is not a matter of arm-chair theorizing; it can be seen readily in any series of radiographs taken during the treatment of a case that eventually ends up with non-union. Watson Jones has provided convincing evidence, both radiological and clinical, that there is one cause only for non-union of fractures that are in apposition, and that is inadequate immobilization. Formerly the list of causes was a great burden to the student's memory; it included the statements that the cause was too little or too much immobilization (without any hint as to how two exactly opposite processes could attain the same result), to damage to the nutrient artery or to the presence of synovial membrane between the fragments, as in case of fracture of the neck of the femur. In answer to these arguments, Watson Jones cites as proof for his contention that inadequate immobilization is the only true cause of non-union, the examples provided by bones that used to be the common sites for delayed or non-union. Two of these are the carpal scaphoid and the neck of the femur, the adequate treatment of which was neglected for years. In the days that preceded the treatment of the latter fracture by adequate immobilization provided by a Whitman's abduction plaster, or by operative fixation by means of a bone graft or of a Smith Petersen steel pin, union was extremely rare, the textbook explanation being that in old people the neck was almost avascular and that the injury by damaging the blood supply prevented repair. How untrue this is can be seen by studying the radiograph of ununited cases; at once it is seen that the neck has disappeared, but that the relatively avascular head is well preserved. The destruction or decalcification has occurred at the distal side of the fracture, the portion of bone which actually receives a good supply of blood since it is continuous with the main shaft. The explanation is that repeated unchecked trauma occurring at the site of fracture has caused inflammatory hyperæmia which in turn has caused decalcification. The modern method of treatment by a Royal Whitman's plaster or by operative fixation prevents this, and is succeeded by sound bony union even in the very aged.

In fractures of the carpal scaphoid the early x-ray evidence consists of linear cracks through the waist;

if the wrist-joint is not adequately immobilized in plaster the fractured surfaces constantly rub against each other, producing traumatic hyperæmia and the inevitable decalcification; the crack rapidly becomes wider and a later radiogram shows the existence of an apparent cyst in the bone. If, however, the fracture has been rested by a suitable plaster case, union occurs, as elsewhere, by sound bony union. I have never yet seen a case of fractured scaphoid treated from the start by massage undergo bony consolidation. Massage therefore can have no place in the treatment of recent fractures of the femoral neck or of the carpal scaphoid, since its employment necessitates removal of the all-important plaster. The same principles of treatment can be applied to other fractures.

The massage enthusiasts will condemn this reasoning and assert that fractures unite all the better for movement of the fractured surfaces on each other, basing their claims on clinical grounds, but also on the utterly unsound and unscientific theory that an increase in blood supply causes more rapid union. They will point out that fractured ribs always unite, however treated, that fractured clavicles, although inadequately fixed, consolidate, and that broken bones in animals are repaired without any fixation, and that in fact the movements improve the chances of union and therefore provide evidence of the value of massage. These arguments can be refuted; x-ray screenage of a fractured rib will show that no movement takes place between the broken ends and that the rib moves as a whole, splinted undoubtedly by the tonically-contracted intercostal muscles above and below, acting as muscles everywhere in the body do when neighbouring structures are damaged or diseased, in their attempt to provide physiological rest. The patient with the fractured clavicle is always one of our most apprehensive patients; note his marked reluctance to allow us to move his shoulder, and the figure of rigid immobility (as regards the upper part of his body) that he presents as he walks into the casualty department. How tightly contracted are the tendons in the case of a fractured leg in the dog, and how rigidly is the whole limb held. Nature in these instances is attempting to provide immobilization; it is but one of many calls on the part of diseased structures for rest and on it was based almost all the orthopædic teaching of Hugh Owen Thomas.

The doctrine of modern fracture treatment has three tenets: (1) Fractures must be reduced anatomically; (2) the fractured surfaces must be completely immobilized until union is sound; (3) the limb must be allowed as full functional activity as possible.

There is no evil in the employment of massage in itself, for it undoubtedly soothes soft parts, and is valuable in reducing œdema; indeed, before applying plaster cases we are careful to disperse the œdema from the parts by firm massage; it must, however, be regarded as an ancillary method which can never be justified if its employment entails abandoning, for however short a time, the adequate immobilization of recent fractures. And since the majority of fractures now are treated by plaster case immobilization, it is evident that massage is severely limited. Unfortunately, massage in many instances has a bad effect upon the mentality of the patient. Vance writes: 'For the patient the warmth, the rubbing, the social atmosphere, all tend to make the situation pleasant. He likes it, and comes again, and keeps on coming until he is a confirmed invalid'.

While massage is perhaps permissible, though unnecessary, and certainly never to be employed at the expense of adequate fixation of the fracture, the use of passive movements must be strenuously opposed and condemned in recent cases. Such movements inevitably occasion movement at the site of fracture, and by their repeated traumatic effect cause hyperæmia and further hæmorrhages. When condemning massage, Bohler must be thinking especially of the evils of passive movements: 'The use of massage and passive movements in cases of recent fractures and of injuries to joints is to-day the commonest cause of bad results

and of non-union. This so-called functional treatment should therefore be unconditionally excluded from the conduct of recent cases. Angulation, shortening and rotatory deformities cannot be prevented by massage, but they can be increased'.

If the retentive apparatus be removed before union is sound, stresses and strain will appear at the fractured surfaces to cause hyperæmia and its inevitable sequel, decalcification; these evil effects will be multiplied if in addition passive movements are adopted. A fracture that has according to the radiograph been perfectly reduced may during a course of massage treatment become re-deformed. This actually occurs quite commonly in cases of Colles's fracture treated in physio-therapy departments (Harry Platt). It occurs about the third or fourth week, and is due to the fact that the repeated trauma to the inadequately immobilized fractured surfaces during the course of treatment leads to hyperæmic decalcification, so that separation of the impacted fragments occurs, and this is followed by the slow recurrence of the posterior displacement. If this happens in the case of Colles's fracture its even readier occurrence in fractures of the shafts of the humerus, of the radius and ulna, and of the tibia and fibula, can be appreciated.

However much massage and passive movements are condemned, no praise can be too high for the adequate provision by the patient himself of active movements. Lucas Championniere, regarded erroneously as the father of massage, was himself always pointing out that no movements could be so satisfactory as those provided by the patient's own muscles. Such a principle is obviously the underlying basis of all athletic training: it must be applied enthusiastically to the fractured limb. Fortunately it can and is being applied to-day in the treatment of recent fractures, so that cases of Colles's fracture are now reduced, put up in unpadded plastic cases, forbidden to wear slings and encouraged from the start to use the hand and elbow and shoulder just as if no fracture had occurred. Since the plaster prevents any movement at the fractured surface, pain is abolished and the patient is delighted to find that he can do any reasonable task in spite of his fracture. How different is his expression from that martyred look that used to grace the face of the hero as he waited in the massage queue with his arm in a sling and his overcoat held on his shoulder by a devoted wife.

It is impossible here to describe the modern methods of plaster fixation; unpadded splints are used, but extreme care must be taken in their application, and their use is only permissible after careful study of the method; a full description of them is found in Bohler's book, and in an excellent recent article by Pridie. Such splints are light, fit accurately, and while immobilizing the fracture in a way that is impossible with any wooden or iron splint allow the patient to use the affected limb so that fractured tibia cases can walk in them after a few days' teaching.

A Programme for Nutrition Surveys

By L. J. HARRIS, sc.d., d.sc.

(From the *Lancet*, Vol. I, 25th April, 1936, p. 966)

CONSIDERABLE discussion has taken place recently as to the most suitable formula to be used in the assessment of malnutrition, as based on measurements of physique (that is, on data for weight, height, and/or age). Some workers have urged the desirability of substituting measurements of physical performance for those of physical development. Others again would rely more exclusively on clinical appearance.

It is apparent, however, that all these methods have serious limitations. In the first place they may easily fail to detect earlier and less obvious stages of undernutrition. Secondly they may give inadequate information about the specific nature of the deficiency or deficiencies in question—more especially when the deficiency is partial or moderate only.

The above criticisms may at first sight seem rather sweeping, but one may illustrate their truth by reference

to the results of a number of recent inquiries in which the incidence of undernutrition has been determined by more specific methods.

The observations of Helen Mackay on the prevalence of nutritional anæmia may be chosen as the first example. She observed that 70 per cent of a group of poor-class bottle-fed babies in London suffered from some degree of nutritional anæmia; the deficiency was associated with an increased morbidity rate, so that when the anæmia was cured by provision of extra iron the morbidity rate was duly diminished. A similar high incidence of anæmia has been observed elsewhere—*e.g.*, for mothers at Aberdeen and at London. The important point to realize is that this specific evidence of malnutrition was detected only after laboratory test, and that reliance on the more cursory clinical methods or on 'weight ratios' would have failed to reveal unmistakably the presence of undernutrition in most of these individuals.

As a further example, the figures relating to the incidence of rickets may be mentioned. According to official statistics in 1928, 87 per cent of a group of 1,635 five-year-old London school-children were found after special examination to show evidence of 'some degree of rickets'; yet in the great majority of cases their nutrition would have been returned as 'normal' by the ordinary school medical examination.

Finally the experiments of Corry Mann may be alluded to. Carefully controlled experimental observations by this worker and by many others subsequently have shown conclusively that for optimum development and health a school child needs not less than one pint of milk per day. Yet, although large sections of the population are unable to receive their daily pint, examination by the school medical service—which under existing conditions must frequently be somewhat cursory—is generally incapable of revealing such degrees of sub-optimum nutrition.

It is considerations such as the foregoing which indeed form the justification for basing estimates of malnutrition (or undernutrition) not so much on existing public health returns as on a knowledge of the amount of money actually available for food for given groups of the population. When the amount of money available is less than that which expert opinion considers to be the minimum necessary for the maintenance of health, then a presumption must be raised that some degree of undernutrition is present. Orr calculated in 1934 that no less than 10,000,000 individuals in this country were unable to afford even the bare minimum figure (at the present time perhaps 20,000,000, representing 40 per cent of the population, are considered to have diets below the *optimum*).

To sum up the foregoing arguments, it may be said that three principal objections can be raised to attempts to assess undernutrition by methods based solely on physique, on physical performance, or on superficial clinical appearance. These objections are: (1) the absence of standards of reference, (2) that such standards as do exist may be debased standards, and (3) that the worst and more obvious of the effects of undernutrition may be delayed.

(1) *Absence of standards.*—The difficulties due to absence of standards are at once apparent from statistics such as the following: In comparable areas in Northumberland (as Dr. J. C. Spence has pointed out) the official returns for malnutrition may vary from 0.5 per cent to 7.5 per cent! At Bootle the malnutrition rate is given as 12 times that of Liverpool—of which it is a suburb. Or, again a prosperous borough like Twickenham owns to a malnutrition rate six times that of Wigan.

(2) *As to the use of debased standards,* it is sufficient to say that large numbers of returns are based on *past averages* instead of possible optimal figures, and it is often overlooked that there has been a steady improvement in height and weight values for elementary school-children in many parts of the country during the past decade or two; while in controlled experiments in which children have been allowed more generous

dietaries their weights and heights have shown considerable advances over the old average figures, which are still too often taken as 'normal' values. No doubt the ideal standards for weights and heights under conditions of optimum nutrition have still to be determined.

(3) As to the difficulty of recognizing the milder or earlier stages of malnutrition enough has already been said to show that disorders such as nutritional anæmia, mild or early rickets, and sub-scurvy, may be the cause of definite ill health and lead to still more serious defects in later life and may yet escape notice unless special methods are used for their detection.

A consideration of these facts leads me to suggest that the time is ripe to draw up a schedule of the tests which are now available for the determination of specific nutritional deficiencies. It is greatly to be hoped that a series of surveys employing such methods of test should be undertaken (on random specimens of the population) in different areas, so that a conspectus may be obtained of the incidence of definite defects of nutrition throughout the country.

Tests for specific deficiencies

VITAMIN A

(a) *Photometer test* (Jeans and Zentmire).—The most sensitive method so far proposed for the detection of vitamin-A subnutrition is based on sensitivity to light following partial dark adaptation. The principle of the technique depends on the well-known fact that visual purple is a compound of vitamin A, and that in the absence of an optimum dietary allowance of the vitamin the rate of regeneration of the visual purple is subnormal. As a check on the accuracy of the method, those subjects showing low values should be given an adequate source of vitamin A for a week or two, and if such treatment is found to be only followed by a return to a normal visual value, it may be reasonably held to confirm the conclusion that vitamin-A deficiency was the cause of the defect.

Using this method Jeans and Zentmire found that in a group of 213 children from Iowa City, U. S. A., whom they examined, no less than 45 had subnormal dark adaptation. Of the latter, a group of 21 were treated as controls with cod-liver oil, and were then found to return to normal in an average period of 12 days. The subjects chosen for investigation were, it is true, a group of physically afflicted children from the lower economic classes, but it is significant that as many as 21 per cent were found to have some degree of vitamin-A deficiency.

(b) *Post-mortem determinations of liver reserves.*—Some indication of the variations in the vitamin-A reserves in different sections of the population may be obtained from post-mortem analyses of the liver (carried out by means of a colorimetric test, by the SbCl_3 method). The vitamin-A reserves of the body are known to be stored almost entirely in the liver, and the amount so stored depends on that provided in the diet. For the sake of more accurate comparison, accident or surgical cases are best taken, since in medical cases the possible provision of a diet rich in vitamin A since admission to hospital may sometimes give a figure deceptively higher than that truly representative of the previous home conditions. Absolute standards of 'normality' for the liver reserves are not yet known, so that results must be given a general qualitative significance rather than a strict quantitative interpretation. The most comprehensive results so far published are due to Moore, and he gives the provisional finding that about 16 per cent of cases show 'subnormal' vitamin-A reserves. For purposes of calculation it may be borne in mind that the minimum daily dose of vitamin A needed by a man, woman, or child is thought to be in the region of 1,000 'Sherman-Munsell rat units' (= about 1,400 international units) per day.

VITAMIN B₁

Urinary excretion test.—A method has just been described (Harris and Leong) by which the amount of vitamin B₁ excreted in the urine may be used as an

index of the dietary intake. Large-scale surveys have still to be undertaken, but as a provisional guide it may be held that subjects excreting less than 12 I. U. (international units) per day (for a ten-stone man) and failing to show a response to a single test dose of (say) 500 I. U. have been receiving a diet unduly low in vitamin B₁. The significance of a suboptimal intake of vitamin B₁ in nutrition may be seen from the results of various workers who have shown that the weight and height gains of children were considerably improved beyond those of the controls when extra vitamin B₁ (or B) was added to the diet (mainly in the form of cereal preparations).

Vitamin-B₂ complex.—The significance of the various components of the vitamin-B₂ complex in human nutrition is not yet sufficiently well understood to warrant any detailed consideration here. The following points may be worthy of note however:—

Lactoflavin is excreted in the urine, and apparently in amounts depending on the dietary consumption, and it may be estimated readily by a fluoroscope test; but until more is known of the physiological rôle of lactoflavin and the effects of its deficiency, such tests are outside the scope of our present discussion.

Vitamin B₆, the so-called rat-pellagra factor, is also of unknown significance for human nutrition, and no methods of test for its deficiency in man are known.

The pellagra-preventing (PP) factor, although it has not yet been chemically identified, is of importance in many regions of the globe—e.g., over 7,000 deaths per annum from pellagra occurred in the U. S. A. in 1928–30, according to official returns. Unfortunately no tests seem yet available for subclinical degrees of deficiency.

VITAMIN C

(a) *The urinary excretion test* depends on the fact that the amount of vitamin C excreted daily in human urine and the response to a test dose depend on the past intake: the measurements are made by a simple chemical titration, depending on reduction of the redox dye, 2:6-dichlorophenolindophenol under specified conditions. A considerable amount of quantitative work has already been done. It has been shown that if less than a certain amount of specific reducing substance (expressed as ascorbic acid) is excreted daily (*viz.* 1.0 to 1.5 mg. per stone of body-weight) and if there is no response to a given test dose (*viz.* 70 mg. per stone of body-weight), a presumption must be raised that the diet of the subject has contained less than the reputed minimal-optimum dose of vitamin C (e.g., 25 mg. per day for an adult). A survey of subjects of the voluntary hospital class, recently concluded, indicates that a suboptimal intake of vitamin C is indeed of common occurrence. It has similarly been pointed out that although current teaching recommends the consumption of orange juice daily by all bottle-fed babies, many do in fact receive too little—a conclusion confirmed by tests carried out on the urine.

(b) *Capillary resistance test* (Göthlin).—An alternative method described by Göthlin depends on the fact that with inadequate intake of vitamin C the capillary resistance becomes subnormal. This is apparently the earliest clinical symptom of sub-scurvy. As measured by Göthlin's method, a count is made of the number of petechiæ which appear in a given area on the surface of the arm when a stated pressure is applied by means of a tourniquet. The objection which may be raised, that a diminished capillary resistance is not pathognomonic for scurvy but is seen in other conditions also, is largely met by a procedure described by Göthlin, according to which whenever a low value is found a source of vitamin C may be administered and a return to a normal value in the course of a week or two confirms the diagnosis. By this method Göthlin found that in Norrland (in Northern Scandinavia) one child out of every five gave evidence of hypovitaminosis C.

VITAMIN D

(a) *Blood phosphatase test for active rickets.*—Probably the most sensitive test for detecting active

or current rickets is based on a measurement of the amount of phosphatase in the blood, as described by Smith. With the start of the rachitic process the phosphatase content of the blood rises above normal, and promptly sinks again once the curative action has begun. The laboratory estimation is fairly straightforward, and should be made the subject of surveys on a larger scale.

(b) *Examination for past rickets.*—As it is important to know not only whether the rachitic process is active at the moment when the test is carried out but also whether there is a history of rickets, an examination should be included for the stigmata of past rickets. The methods used (see for example the London inquiry of 1928) are simple and well known; x-ray investigation should be combined with examination for enlarged epiphyses and characteristic bony deformities (the Newman Committee of 1931 accepted the following as 'rachitic signs': parietal bossing, frontal bossing, radial epiphyses, spinal curvature, knock knees, bow legs, bowing of tibia, beaded ribs, changes in chest wall).

IRON (NUTRITIONAL ANÆMIA)

The striking results of Mackay and others on the high incidence of nutritional anæmia, and of the damage which it causes to health, have already been alluded to. When the laboratory method for its detection is so relatively simple, there is every reason why it should be included in nutritional surveys of the kind we have in mind.

OTHER ESSENTIALS

The above list, while making no claim to completeness, probably does summarize the tests which are most easily carried out.

Evidence of a deficient intake of other important dietary constituents, such as protein, or calcium, or phosphate is more readily determined by a direct study of the budget and of the food actually consumed by the members of the family—rather than by the necessarily complex procedure of estimation of 'retention' in 'balance' experiments. The latter kind of inquiry has, it is true, given invaluable information in a few well-chosen surveys which have been carried out, mainly in the hands of Sherman and his co-workers in America. Such tests are, however, generally beyond the scope of ordinary routine inquiries. An exception might, perhaps, sometimes be made for blood analysis for calcium and inorganic phosphate, a low phosphate (or low Ca × P product) being nearly always indicative of a rachitic process. Similarly, hypocalcæmia, giving rise to spasmophilia, may be detected by diminished resistance, on test, to electrical stimulus.

SUMMARY

Limitations in the method of assessing undernutrition by means of observations based on the superficial clinical appearance, on physique, or on physical performance are: (1) the absence of standards of reference, (2) that such standards as are in use may be debased, (3) that the more obvious ill-effects of undernutrition may be delayed, and (4) that such methods may fail to indicate the specific nature of the deficiencies responsible. The following methods, *inter alia*, are now available for the determination of specific deficiencies:—

(1) *Vitamin A.*—(a) Photometer test for dark adaptation (visual-purple formation). (b) Post-mortem estimates of vitamin-A reserves in liver.

(2) *Vitamin B₁.*—Urinary excretion test.

(3) *Vitamin C.*—(a) Urinary excretion test. (b) Test for diminished capillary resistance.

(4) *Vitamin D.*—(a) Phosphatase test for active rickets. (b) X-ray and clinical examination (bony deformities) for past rickets.

(5) *Iron* (nutritional anæmia).—Hæmoglobin estimation.

Surveys are required based on the collection of such data.

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The observations of Helen Mackay on the prevalence of nutritional anæmia may be chosen as the first example. She observed that 70 per cent of a group of poor-class bottle-fed babies in London suffered from some degree of nutritional anæmia; the deficiency was associated with an increased morbidity rate, so that when the anæmia was cured by provision of extra iron the morbidity rate was duly diminished. A similar high incidence of anæmia has been observed elsewhere—e.g., for mothers at Aberdeen and at London. The important point to realize is that this specific evidence of malnutrition was detected only after laboratory test, and that reliance on the more cursory clinical methods or on 'weight ratios' would have failed to reveal unmistakably the presence of undernutrition in most of these individuals.

As a further example, the figures relating to the incidence of rickets may be mentioned. According to official statistics in 1928, 87 per cent of a group of 1,635 five-year-old London school-children were found after special examination to show evidence of 'some degree of rickets'; yet in the great majority of cases their nutrition would have been returned as 'normal' by the ordinary school medical examination.

Finally the experiments of Corry Mann may be alluded to. Carefully controlled experimental observations by this worker and by many others subsequently have shown conclusively that for optimum development and health a school child needs not less than one pint of milk per day. Yet, although large sections of the population are unable to receive their daily pint, examination by the school medical service—which under existing conditions must frequently be somewhat cursory—is generally incapable of revealing such degrees of sub-optimum nutrition.

It is considerations such as the foregoing which indeed form the justification for basing estimates of malnutrition (or undernutrition) not so much on existing public health returns as on a knowledge of the amount of money actually available for food for given groups of the population. When the amount of money available is less than that which expert opinion considers to be the minimum necessary for the maintenance of health, then a presumption must be raised that some degree of undernutrition is present. Orr calculated in 1934 that no less than 10,000,000 individuals in this country were unable to afford even the bare minimum figure (at the present time perhaps 20,000,000, representing 40 per cent of the population, are considered to have diets below the optimum).

To sum up the foregoing arguments, it may be said that three principal objections can be raised to attempts to assess undernutrition by methods based solely on physique, on physical performance, or on superficial clinical appearance. These objections are: (1) the absence of standards of reference, (2) that such standards as do exist may be debased standards, and (3) that the worst and more obvious of the effects of undernutrition may be delayed.

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It is considerations such as the foregoing which indeed form the justification for basing estimates of malnutrition (or undernutrition) not so much on existing public health returns as on a knowledge of the amount of money actually available for food for given groups of the population. When the amount of money available is less than that which expert opinion considers to be the minimum necessary for the maintenance of health, then a presumption must be raised that some degree of undernutrition is present. Orr calculated in 1934 that no less than 10,000,000 individuals in this country were unable to afford even the bare minimum figure (at the present time perhaps 20,000,000, representing 40 per cent of the population, are considered to have diets below the optimum).

To sum up the foregoing arguments, it may be said that three principal objections can be raised to attempts to assess undernutrition by methods based solely on physique, on physical performance, or on superficial clinical appearance. These objections are: (1) the absence of standards of reference, (2) that such standards as do exist may be debased standards, and (3) that the worst and more obvious of the effects of undernutrition may be delayed.

(1) *Absence of standards.*—The difficulties due to absence of standards are at once apparent from statistics such as the following: In comparable areas in Northumberland (as Dr. J. C. Snence has pointed out) the official returns for malnutrition may vary from 0.5 per cent to 7.5 per cent! At Bootle the malnutrition rate is given as 12 times that of Liverpool—of which it is a suburb. Or, again a prosperous borough like Twickenham owns to a malnutrition rate six times that of Wigan.

(2) *As to the use of debased standards,* it is sufficient to say that large numbers of returns are based on *past averages* instead of possible optimal figures, and it is often overlooked that there has been a steady improvement in height and weight values for elementary school-children in many parts of the country during the past decade or two; while in controlled experiments in which children have been allowed more generous

dietaries their weights and heights have shown considerable advances over the old average figures, which are still too often taken as 'normal' values. No doubt the ideal standards for weights and heights under conditions of optimum nutrition have still to be determined.

(3) As to the difficulty of recognizing the milder or earlier stages of malnutrition enough has already been said to show that disorders such as nutritional anæmia, mild or early rickets, and sub-scurvy, may be the cause of definite ill health and lead to still more serious defects in later life and may yet escape notice unless special methods are used for their detection.

A consideration of these facts leads me to suggest that the time is ripe to draw up a schedule of the tests which are now available for the determination of specific nutritional deficiencies. It is greatly to be hoped that a series of surveys employing such methods of test should be undertaken (on random specimens of the population) in different areas, so that a conspectus may be obtained of the incidence of definite defects of nutrition throughout the country.

Tests for specific deficiencies

VITAMIN A

(a) *Photometer test* (Jeans and Zentmire).—The most sensitive method so far proposed for the detection of vitamin-A subnutrition is based on sensitivity to light following partial dark adaptation. The principle of the technique depends on the well-known fact that visual purple is a compound of vitamin A, and that in the absence of an optimum dietary allowance of the vitamin the rate of regeneration of the visual purple is subnormal. As a check on the accuracy of the method, those subjects showing low values should be given an adequate source of vitamin A for a week or two, and if such treatment is found to be only followed by a return to a normal visual value, it may be reasonably held to confirm the conclusion that vitamin-A deficiency was the cause of the defect.

Using this method Jeans and Zentmire found that in a group of 213 children from Iowa City, U. S. A., whom they examined, no less than 45 had subnormal dark adaptation. Of the latter, a group of 21 were treated as controls with cod-liver oil, and were then found to return to normal in an average period of 12 days. The subjects chosen for investigation were, it is true, a group of physically afflicted children from the lower economic classes, but it is significant that as many as 21 per cent were found to have some degree of vitamin-A deficiency.

(b) *Post-mortem determinations of liver reserves.*—Some indication of the variations in the vitamin-A reserves in different sections of the population may be obtained from post-mortem analyses of the liver (carried out by means of a colorimetric test, by the SbCl_5 method). The vitamin-A reserves of the body are known to be stored almost entirely in the liver, and the amount so stored depends on that provided in the diet. For the sake of more accurate comparison, accident or surgical cases are best taken, since in medical cases the possible provision of a diet rich in vitamin A since admission to hospital may sometimes give a figure deceptively higher than that truly representative of the previous home conditions. Absolute standards of 'normality' for the liver reserves are not yet known, so that results must be given a general qualitative significance rather than a strict quantitative interpretation. The most comprehensive results so far published are due to Moore, and he gives the provisional finding that about 16 per cent of cases show 'subnormal' vitamin-A reserves. For purposes of calculation it may be borne in mind that the minimum daily dose of vitamin A needed by a man, woman, or child is thought to be in the region of 1,000 'Sherman-Munsell rat units' (= about 1,400 international units) per day.

VITAMIN B₁

Urinary excretion test.—A method has just been described (Harris and Leong) by which the amount of vitamin B₁ excreted in the urine may be used as an

(b) *Examination for past rickets*.—As it is important to know not only whether the rachitic process is active at the moment when the test is carried out but also whether there is a history of rickets, an examination should be included for the stigmata of past rickets. The methods used (see for example the London inquiry of 1928) are simple and well known; x-ray investigation should be combined with examination for enlarged epiphyses and characteristic bony deformities (the Newman Committee of 1931 accepted the following as 'rachitic signs': parietal bossing, frontal bossing, radial epiphyses, spinal curvature, knock knees, bow legs, bowing of tibia, beaded ribs, changes in chest wall).

The striking results of Mackay and others on the high incidence of nutritional anæmia, and of the damage which it causes to health, have already been alluded to. When the laboratory method for its detection is so relatively simple, there is every reason why it should be included in nutritional surveys of the kind we have in mind.

The above list, while making no claim to completeness, probably does summarize the tests which are most easily carried out.

Evidence of a deficient intake of other important dietary constituents, such as protein, or calcium, or phosphate is more readily determined by a direct study of the budget and of the food actually consumed by the members of the family—rather than by the necessarily complex procedure of estimation of 'retention' in 'balance' experiments. The latter kind of inquiry has, it is true, given invaluable information in a few well-chosen surveys which have been carried out, mainly in the hands of Sherman and his co-workers in America. Such tests are, however, generally beyond the scope of ordinary routine inquiries. An exception might, perhaps, sometimes be made for blood analysis for calcium and inorganic phosphate, a low phosphate (or low $\text{Ca} \times \text{P}$ product) being nearly always indicative of a rachitic process. Similarly, hypocalcaemia, giving rise to spasmophilia, may be detected by diminished resistance, on test, to electrical stimulus.

SUMMARY

Limitations in the method of assessing undernutrition by means of observations based on the superficial clinical appearance, on physique, or on physical performance are: (1) the absence of standards of reference, (2) that such standards as are in use may be debased, (3) that the more obvious ill-effects of undernutrition may be delayed, and (4) that such methods may fail to indicate the specific nature of the deficiencies responsible. The following methods, *inter alia*, are now available for the determination of specific deficiencies:—

- (1) *Vitamin A*.—(a) Photometer test for dark adaptation (visual-purple formation). (b) Post-mortem estimates of vitamin-A reserves in liver.
- (2) *Vitamin B₁*.—Urinary excretion test.
- (3) *Vitamin C*.—(a) Urinary excretion test. (b) Test for diminished capillary resistance.
- (4) *Vitamin D*.—(a) Phosphatase test for active rickets. (b) X-ray and clinical examination (bony deformities) for past rickets.
- (5) *Iron* (nutritional anaemia).—Haemoglobin estimations.

Surveys are required based on the collection of such data.

indeed of common occurrence. It has similarly been pointed out that although current teaching recommends the consumption of orange juice daily by all bottle-fed babies, many do in fact receive too little—a conclusion confirmed by tests carried out on the urine.

(b) *Capillary resistance test* (Göthlin).—An alternative method described by Göthlin depends on the fact that with inadequate intake of vitamin C the capillary resistance becomes subnormal. This is apparently the earliest clinical symptom of sub-scurvy. As measured by Göthlin's method, a count is made of the number of petechiæ which appear in a given area on the surface of the arm when a stated pressure is applied by means of a tourniquet. The objection which may be raised, that a diminished capillary resistance is not pathognomonic for scurvy but is seen in other conditions also, is largely met by a procedure described by Göthlin, according to which whenever a low value is found a source of vitamin C may be administered and a return to a normal value in the course of a week or two confirms the diagnosis. By this method Göthlin found that in Norrland (in Northern Scandinavia) one child out of every five gave evidence of hypovitaminosis C.

VITAMIN D

(a) *Blood phosphatase test for active rickets.*—Probably the most sensitive test for detecting active

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Present Position of Treatment with Bacteriophage

(From the *British Medical Journal*, Vol. I, 30th May, 1936, p. 1114)

AMONG modern innovations in therapeutics, treatment with bacteriophage offers singular opportunities to the purveyor of doubtful remedies. It can be produced cheaply, has for the present the diminishing asset of novelty, and is credited with an action which captivates the imagination. It is perhaps time that we should consider what the truth about this method of treatment really is, and any serious inquirer will find much of what he needs to know in a series of papers published more than eighteen months ago by Eaton and Bayne-Jones, who were commissioned by the American Medical Association to review and report on the literature of this subject. Several important conclusions were reached by these authors which are largely practised to-day.

It has been proved repeatedly that bacteriophage is inactive in the presence of blood or serum. This fact, in the absence of any rebutting evidence, appears to dispose at once of any possibility of employing it usefully by any method of parenteral injection. Its activity, when not abolished, diminishes in varying degrees in the presence of all other body fluids when tested *in vitro*. A second theoretical objection of the first importance is that its action *in vivo* cannot be distinguished from that of a sort of vaccine, which any bacteriophage preparation necessarily is. It must contain, among other things, the constituents of lysed bacteria, and these may well immunize if injected into tissues, or may even, if there is anything at all in Besredka's idea of local immunity, have some effect when merely applied to a surface. A favourable result may in fact illustrate the truth as enunciated by d'Herelle or by Besredka, but certainly not both, and possibly neither. Another serious flaw in the case for bacteriophage as a therapeutic weapon is the sufficiency of experimental evidence for its activity: well-controlled animal experiments on an adequate scale should be capable of illustrating its therapeutic capacity, and such experiments have usually yielded disappointing or completely negative results. Clinical evidence, though admittedly the final court of judgment in all such matters, is voluminous and confusing, and often so coloured by the enthusiasm of its authors as to be of doubtful evidential value. It is the belief of Eaton and Bayne-Jones that the case in favour of bacteriophage treatment has been made out only for local staphylococcal infections and 'perhaps' for cystitis; this judgment may perhaps err on the side of severity.

If subsequent reports are studied in the light of these conclusions they appear to fall into two categories.

In one the methods used are such as to be theoretically capable of success, adequate numbers of cases are treated and studied with care, and conclusions are drawn judiciously. Wehrlein, for example, has obtained success in infections of the urinary tract by the local instillation of bacteriophage chosen for its capacity to lyse the organism causing the infection; he declares emphatically that only the introduction of bacteriophage into the urinary tract can secure its lytic action; subcutaneous injection only produces a 'vaccine effect'. Another careful study is that of Pasricha, de Monte and O'Flynn, who treated 684 cases of cholera with specially prepared bacteriophage and 685 (alternate) cases without it: there was a significant difference in mortality, which becomes even more marked when only those cases are reckoned in which agglutinable vibrios were isolated. On the other hand, a report such as that of MacNeal and Frisbee is by no means so convincing. These authors treated with bacteriophage 100 cases of staphylococcal septicæmia, most of which they themselves never saw; the preparation was given intravenously in large and increasing doses at intervals

of two hours until 'shock' was produced. Here interpretation is most obviously complicated by the possibility of effects quite other than that of bacterial lysis, and the achievement of 'reducing' the mortality of this disease to 75 per cent, when allowance has been made for possible errors in bacteriological diagnosis, is hardly striking. These authors have previously advocated bacteriophage treatment for urinary infections, septicæmia, and colitis by methods some of which are not calculated to attain any lytic effect. Stock preparations were used in these studies without as a rule any attempt to ascertain whether they would lyse the infecting organism, and the same objection applies to the work of Pretty, who claims success from infiltrating the periphery of carbuncles with a commercial bacteriophage preparation. He goes on to recommend that in general furunculosis 2 c.cm. of this material should be swallowed in a wineglass of Vichy water before breakfast, a proceeding which is said to give 'excellent results'. Why it should have any effect at all is past understanding.

The proper attitude towards this method of treatment in the present state of knowledge is one of scepticism. In particular its commercial exploitation is to be discouraged. Only carefully controlled studies are likely to bring us any nearer the truth, and for these one of the first requirements is that the bacteriophage employed shall be known to lyse the infecting organism, and this in the case of a commercial preparation cannot be assumed. When an advance in therapeutic technique must depend for its establishment on laboratory services which few investigators can command it is no doubt a misfortune, but that is unquestionably the position here.

Relation of Dietary Calcium and Phosphorus

(From the *Journal of the American Medical Association*, Vol. CVI, 20th June, 1936, p. 2161)

THE ætiological importance of improper diet in the production of rickets and the demands of the maternal organism for the formation of proper skeletal tissue of the young and for the subsequent lactation period have led to the accumulation of data demonstrating the significance of the ratio of calcium to phosphorus in the food. The normal ratio has been defined as from 2:1 to 1:2. Experimental studies of rickets in rats have demonstrated that diets with this relationship between the calcium and phosphorus will not permit rickets to develop and will cure the condition after it has been produced. The failure of normal deposition of calcium phosphate in the bone is usually attributed to the lack of normal concentration of either calcium or phosphorus (or both) in the blood serum and thus in the fluid bathing the bone. The rôle of calcium and phosphorus in determining reproductive success has been studied much less extensively, probably because the effects resulting from deficiencies of these elements appear only after several reproductive cycles.

The emphasis that has been placed on calcium and phosphorus ratios has in general resulted in a lack of consideration of the absolute amounts of either of these two elements in the diet. The low phosphorus type of rickets, which is believed to be most frequent clinically, is also the type most readily produced experimentally, in rats under controlled conditions. Consequently, the distortion of the calcium to phosphorus ratio at the expense of the latter element has generally been employed in the experimental investigation of rickets. However, recent studies of both experimental rickets and the reproductive cycle have varied widely both in the ratios of calcium to phosphorus in the diet and in the absolute amounts of each of these two elements ingested. The interesting data obtained indicate a definite shift in emphasis from one of relative to one of absolute amounts of calcium and phosphorus ingested and serve to illustrate the inadequacy of dealing solely with ratios. Shohl and Wolbach at the Harvard Medical School have extended and supplemented earlier

investigations of the effects on bone formation in rats of high-calcium low-phosphorus diets to include low-calcium high-phosphorus diets. These investigators have correlated serum values and bone ash determinations with both ratios and levels of intake of these two elements; histologic pathology is also included, together with x-ray examination. This most recent work thus systematically completes a survey of the various calcium to phosphorus ratios and levels attainable with natural foodstuffs. In an equally complete investigation, Cox and Imboden have studied the behaviour of experimental rats receiving constant amounts of dietary calcium and phosphorus throughout the entire span of their reproductive life, thus obtaining an index of reproductive success.

The results of the Harvard work clearly indicate the fallacious interpretations that may result from a consideration solely of the calcium and phosphorus ratios of the diet. It seems evident that the absolute amounts of calcium and phosphorus are as important a factor in the production of rickets in rats as is the distortion of the accepted optimal dietary ratio for these two elements. It has been possible to produce rickets in experimental animals ingesting a diet low in both calcium and phosphorus, despite the fact that the calcium to phosphorus ratio in this type of diet was formerly considered 'normal'. The term 'normal ratio', therefore, has thus largely lost its significance, for rickets may be produced with any ratio of calcium to phosphorus. As the absolute amounts of these mineral elements are increased, for any given ratio, the diet changes from a rachitogenic to a non-rachitogenic one. This importance of both level and ratio of these mineral elements is emphasized also by the studies of Cox and Imboden on the success of mother rats in producing and rearing young. A calcium to phosphorus ratio of

1.0, at a calcium level of 0.49 per cent, was established as the optimal level and ratio for successful gestation and lactation in this species. When the calcium level is not exactly known, it seems evident that a calcium phosphorus ratio of 1.0 for the mothers will approximate the optimal, as the highest ash contents of the 21-day-old young were obtained with this ratio. At excessive mineral levels of 2.45 per cent, poor performance was obtained irrespective of the ratio. Phosphate in excess appeared to be better tolerated than an excess of calcium.

Although it is not always rational to transpose data obtained with one species to the explanation of normal and pathologic phenomena in another, the correlation of some of the data obtained in these two investigations with data in the literature for human beings is highly suggestive. Rickets in rats seems to bear a closer relation to rickets in infants and dogs than was formerly supposed, in that rickets is produced with diets in which the ratio has been considered 'normal', provided the amounts of calcium and phosphorus are sufficiently low. The essentials for the production of rickets thus appear to be an inadequacy of vitamin D accompanied by a relative deficiency of calcium or phosphorus or an absolute deficiency of either or both. The reproduction studies suggest that a calcium to phosphorus ratio of less than 1.0, which has been recommended by Sherman for normal adult maintenance and by Toverud for gestation, may be related to the low calcium intake which, in balance studies, has been observed in human pregnancy. It remains for future investigations to determine why a ratio of less than 1.0 is preferable at low calcium levels, but the importance of the absolute as well as the relative amount of dietary calcium and phosphorus appears to be clearly established by these recent studies.

Reviews

TAYLOR'S PRACTICE OF MEDICINE.—By E. P. Poulton, M.A., D.M. (Oxon.), F.R.C.P. (Lond.). With the assistance of C. P. Symonds, M.A., D.M. (Oxon.), F.R.C.P. (Lond.), H. W. Barber, M.A., M.B. (Camb.), F.R.C.P. (Lond.), R. D. Gillespie, M.D. (Glas.), F.R.C.P. (Lond.), D.P.M. (Lond.), N. Hamilton Fairley, O.B.E., M.D., D.Sc. (Melb.), F.R.C.P. (Lond.), and W. M. Mollison, C.B.E., M.Ch. (Camb.), F.R.C.S. (Eng.). Fifteenth Edition. 1936. J. and A. Churchill Limited, London. Pp. xvi plus 1136, with 71 plates (16 coloured) and 104 text-figures. Price, 28s.

To those who have been nourished on the successive editions of *Taylor's Medicine* from their student days the arrival of a new edition is a matter of considerable importance. For thirty years, during which time the book went through eleven editions, Sir Frederick Taylor was the sole author. Though there are immense advantages associated with single authorship, the time has now passed when one man can hope to cover the vast field of medicine and produce anything but a summary of the subject suitable for the student about to take his examination. Yet the textbook 'by numerous writers' has the obvious disadvantages of inevitable repetition and lack of homogeneity. The new editor, Dr. E. P. Poulton, in preparing the twelfth edition, compromised by taking into collaboration two associates, later another collaborator was added, and in the present fifteenth edition a further two, so that there are now six writers responsible for this work.

Not only have the various sections been completely rewritten but in many instances there has been considerable re-arrangement of the matter; for example, infectious diseases have been re-classified on an ætiological basis according to the nature of the causative organism; the same plan has been followed in the

section on diseases of the skin. This latter section is a very complete one and includes a number of very useful coloured plates.

This edition has an outstanding feature that puts the whole book in a class by itself, as far as the tropical worker is concerned, that is, the new section on diseases of the tropics; this section consists of about 130 pages. Dr. Hamilton Fairley has given a most excellent account of this subject in this comparatively small space. The section is very well-balanced; that is to say, each disease is given space relative to its importance, and the writer has resisted the temptation to over-emphasize those diseases on which he himself has worked and has contributed much to our present knowledge. Sprue, for example, is well described in two and a half pages, and, though sufficient data regarding the writer's own high-protein diet are given to allow the reader to construct it, one would have welcomed a few more details. All important recent work on yellow fever has been included, and the same can be said for each disease. Although the subjects are necessarily dealt with concisely, there is sufficient information given to make it possible for the reader to diagnose and treat each disease.

By way of adding a minor criticism—we note that, although the introduction of liver treatment is mentioned as having improved the prognosis in tropical macrocytic anæmia, under the heading of treatment marmite only is mentioned. A cure can be effected by giving this substance alone, but there are obvious advantages in severe cases in giving the fully-formed hæmopoietic principle in the form of liver extract.

The book has maintained its high standard throughout and the practitioner will find it a valuable book on general medicine, but to the tropical worker this last section alone is worth the price asked for the whole volume.

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It has been proved repeatedly that bacteriophage is inactive in the presence of blood or serum. This fact, in the absence of any rebutting evidence, appears to dispose at once of any possibility of employing it usefully by any method of parenteral injection. Its activity, when not abolished, diminishes in varying degrees in the presence of all other body fluids when tested *in vitro*. A second theoretical objection of the first importance is that its action *in vivo* cannot be distinguished from that of a sort of vaccine, which any bacteriophage preparation necessarily is. It must contain, among other things, the constituents of lysed bacteria, and these may well immunize if injected into tissues, or may even, if there is anything at all in Besredka's idea of local immunity, have some effect when merely applied to a surface. A favourable result may in fact illustrate the truth as enunciated by d'Herelle or by Besredka, but certainly not both, and possibly neither. Another serious flaw in the case for bacteriophage as a therapeutic weapon is the sufficiency of experimental evidence for its activity: well-controlled animal experiments on an adequate scale should be capable of illustrating its therapeutic capacity, and such experiments have usually yielded disappointing or completely negative results. Clinical evidence, though admittedly the final court of judgment in all such matters, is voluminous and confusing, and often so coloured by the enthusiasm of its authors as to be of doubtful evidential value. It is the belief of Eaton and Bayne-Jones that the case in favour of bacteriophage treatment has been made out only for local staphylococcal infections and 'perhaps' for cystitis: this judgment may perhaps err on the side of severity.

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Reviews

TAYLOR'S PRACTICE OF MEDICINE.—By E. P. Poulton, M.A., D.M. (Oxon.), F.R.C.P. (Lond.). With the assistance of C. P. Symonds, M.A., D.M. (Oxon.), F.R.C.P. (Lond.), H. W. Barber, M.A., M.B. (Camb.), F.R.C.P. (Lond.), R. D. Gillespie, M.D. (Glas.), F.R.C.P. (Lond.), D.P.M. (Lond.), N. Hamilton Fairley, O.B.E., M.D., D.Sc. (Melb.), F.R.C.P. (Lond.), and W. M. Mollison, C.B.E., M.Ch. (Camb.), F.R.C.S. (Eng.). Fifteenth Edition. 1936. J. and A. Churchill Limited, London. Pp. xvi plus 1136, with 71 plates (16 coloured) and 104 text-figures. Price, 28s.

To those who have been nourished on the successive editions of *Taylor's Medicine* from their student days the arrival of a new edition is a matter of considerable importance. For thirty years, during which time the book went through eleven editions, Sir Frederick Taylor was the sole author. Though there are immense advantages associated with single authorship, the time has now passed when one man can hope to cover the vast field of medicine and produce anything but a summary of the subject suitable for the student about to take his examination. Yet the textbook 'by numerous writers' has the obvious disadvantages of inevitable repetition and lack of homogeneity. The new editor, Dr. E. P. Poulton, in preparing the twelfth edition, compromised by taking into collaboration two associates, later another collaborator was added, and in the present fifteenth edition a further two, so that there are now six writers responsible for this work.

Not only have the various sections been completely rewritten but in many instances there has been considerable re-arrangement of the matter; for example, infectious diseases have been re-classified on an aetiological basis according to the nature of the causative organism; the same plan has been followed in the

section on diseases of the skin. This latter section is a very complete one and includes a number of very useful coloured plates.

This edition has an outstanding feature that puts the whole book in a class by itself, as far as the tropical worker is concerned, that is, the new section on diseases of the tropics; this section consists of about 130 pages. Dr. Hamilton Fairley has given a most excellent account of this subject in this comparatively small space. The section is very well-balanced; that is to say, each disease is given space relative to its importance, and the writer has resisted the temptation to over-emphasize those diseases on which he himself has worked and has contributed much to our present knowledge. Sprue, for example, is well described in two and a half pages, and, though sufficient data regarding the writer's own high-protein diet are given to allow the reader to construct it, one would have welcomed a few more details. All important recent work on yellow fever has been included, and the same can be said for each disease. Although the subjects are necessarily dealt with concisely, there is sufficient information given to make it possible for the reader to diagnose and treat each disease.

By way of adding a minor criticism—we note that, although the introduction of liver treatment is mentioned as having improved the prognosis in tropical macrocytic anaemia, under the heading of treatment marmite only is mentioned. A cure can be effected by giving this substance alone, but there are obvious advantages in severe cases in giving the fully-formed hæmopoietic principle in the form of liver extract.

The book has maintained its high standard throughout and the practitioner will find it a valuable book on general medicine, but to the tropical worker this last section alone is worth the price asked for the whole volume.

We must congratulate the publishers on having produced such a well-printed book with over seventy plates, many of which are in colour, at such a very reasonable price. We hope that they will be rewarded for their enterprise; the book should certainly have a very wide sale in this country.

L. E. N.

THE ENDOCRINE ORGANS IN HEALTH AND DISEASE WITH AN HISTORICAL REVIEW.—By Sir H. D. Rolleston, Bart., G.C.V.O., K.C.B., M.D. (Hon.), D.Sc., D.C.L., LL.D. 1936. Oxford University Press, London. Humphrey Milford. Pp. xi plus 521. Illustrated. Price, 36s. Obtainable from the Oxford University Press, Bombay

Of the various methods of approach in the study of any science or subdivision of a science, the historical is one of the most satisfactory. A cross-section of our present state of knowledge on any subject is often quite incomprehensible without an appreciation of the stages by which this state of knowledge was arrived at, just as the true nature of structures seen in anatomical and histological studies would never have been understood without parallel studies in embryology.

It was therefore a very happy decision on the part of Sir Humphry Rolleston to expand his lectures on the history of the endocrine organs, delivered before the Royal College of Physicians of London, to bring the 'history' up to the present day, to fill up certain gaps regarding anatomy, physiology and pathology, and to publish the treatise in book form under the above title.

Each endocrine organ is considered separately. Historical references from the time of Hippocrates and Galen, if it was recognized as early as this, are quoted; then its embryology, anatomy—gross and histological, physiology, and association with other endocrine organs are considered; and, finally, each dysfunction of the organ is described separately.

It is difficult to believe that the word endocrinology dates only from 1909. The term 'endocrine' is not usually applied to the liver, the stomach, and the spleen, and has thus a more specific meaning than the term 'ductless glands'. The dysfunction of these organs, even as regards their possible internal secretions, is not considered at any length in this book though reference is made to them.

The book will be found to be a unique source of information on the historical aspects of the subject and a very valuable contribution to the literature on endocrinology from a practical point of view. It will be indispensable to anyone who is proposing to write a paper or carry out any research in this important field.

The format maintains the high standard of the Oxford University publications.

L. E. N.

TREATMENT IN GENERAL PRACTICE. THE MANAGEMENT OF SOME MAJOR MEDICAL DISORDERS. I. (ARTICLES REPUBLISHED FROM THE 'BRITISH MEDICAL JOURNAL'.) 1936. H. K. Lewis and Company, Limited, London. Pp. x plus 250. Price, 8s. 6d.

The publication of a series of articles on 'treatment in general practice' is not exactly an original idea but it is nevertheless a very good one. The papers all appeared in the *British Medical Journal* in the first half of 1935, as a series under the same title as that of the book; from time to time extracts from this series have been published in this journal. They are all written by well-known teachers in the hospitals and universities in Great Britain; the list of contributors includes Lord Horder's and about thirty other well-known names.

This first series of articles is on diseases of the respiratory tract, the acute specific fevers, and cardio-vascular diseases. The plan of grouping them like this is a good one, not only because it is more convenient for future reference but because it gives the reader a better chance of maintaining some continuity of thought should he wish to go through the book systematically.

The individual contributions are almost all of a high standard and throughout practical considerations have been given preference. The reviewer has already profited by reading some of the articles when they first appeared, notably that by Professor Wynn on pneumonia. There is a useful article on asthma by Dr. George Bray. He has perhaps carried the practical point of view a little far. We all know how annoying it is, when some special apparatus or drug is mentioned, not to be able to find out where it can be obtained; this writer has obviated this by giving the names and addresses of the retailers; on one page three such appear.

The last few articles constitute a slight departure from the treatment theme, the final one being on the electrocardiogram in prognosis and diagnosis. This will be very useful to the older practitioner who was not brought up on electrocardiography.

These articles are still appearing and others will in due course be published in book form. They will provide an invaluable reference series for the practitioner.

L. E. N.

THE NATURE AND TREATMENT OF ASTHMA, HAY FEVER AND MIGRAINE WITH OTHER CLINICAL STUDIES ON PYROGENIC THERAPY, OXYGEN WANT, EXAMINATION OF CHEST, CHRONIC BRONCHITIS, PNEUMONIA, PROTRACTED RESOLUTION, FIBROID PNEUMONIA, PULMONARY APEX, ROENTGEN RAYS, RECOVERY FROM SUB-ACUTE PHTHISIS, FIBROID PHTHISIS, PHENOLSULPHONPHTHALEIN, ACUTE NEPHRITIS, FUNCTIONAL ALBUMINURIA, RENAL OEDEMA, ETC. ORIGINAL INVESTIGATIONS.—By A. G. Auld, M.D. 1936. H. K. Lewis and Company, Limited, London. Pp. x plus 257. Price, 12s. 6d.

THE book consists of a collection of papers published by Dr. Auld in the *British Medical Journal* and the *Lancet*. The papers cover a wide range of subjects such as peptone treatment of asthma, hay fever, pyrogenic therapy, physical examination of chest, chronic bronchitis, pneumonia, fibroid phthisis, and the value of x-rays in the diagnosis of pulmonary tuberculosis, etc.

Dr. Auld introduced the peptone treatment of asthma first in 1917 and has subsequently improved and modified his methods. Nearly one-half of the book is devoted to the discussion of this form of treatment of asthma and other allied conditions. He divides the asthmatic patients into two groups with reference to the results obtained with treatment with peptone. One group consists of patients who quickly respond to treatment and in whom the results are more or less lasting. The patients who fall in this group possess good general health and suffer from periodic attacks with periods of remission in between. The second group consists of patients who are partly or completely resistant to treatment. In these patients the affection is of long standing and there is superadded chronic bronchitis and emphysema.

D.

LEGAL PROBLEMS IN MEDICAL PRACTICE.—By D. H. Kitchin. 1936. Edward Arnold and Company, London. Pp. 231. Price, 10s. 6d.

THIS is a useful book for the general practitioner for it indicates the many legal pitfalls that beset his path in the practice of his profession, and how by a little care the majority of them can be avoided.

A large part of the book, dealing as it does with the law of England regarding medico-legal matters, will be of little use in other countries, but it is nevertheless interesting reading and will serve as a guide to procedure in any country whose laws are based on the Roman code.

A few chapters, however, dealing with advice on how a medical witness should behave in the box and how he should prepare his evidence beforehand, are of more general application and would be helpful to a medical

man anywhere. The same applies to the section dealing with the making of wills by patients and what a doctor, who is called on to assist, should do to protect himself from the charge of exerting undue influence on the patient, especially if he is a beneficiary under the will.

Although subject to the limitations of all books on law, that they are only applicable to the country where the laws discussed are in force, it is full of hints that will be useful to practitioners and hospital authorities anywhere.

P. A. M.

THE VEGETATIVE NERVOUS SYSTEM: A CLINICAL STUDY.—By W. Sachs, M.D. 1936. Cassell and Company, Limited, London. Pp. x plus 168, with 8 plates and 35 illustrations in the text. Price, 15s.

THE average clinician has no very clear conception of the vegetative, or autonomic, nervous system, but there are many who must feel that they would like to remedy this defect in their knowledge. In order to do this effectively they would have to dig into numerous textbooks on anatomy, physiology, pharmacology, clinical methods, and general medicine, and then correlate and condense the knowledge they had acquired. This is quite obviously the difficulty that faced the author of this book when he undertook a study of the vegetative nervous system in patients in a mental asylum. Having acquired a comprehensive knowledge of the subject from these various sources and from the recent literature on the subject that has not yet found its way into the textbooks, and having a considerable practical experience of clinical experimental methods, the author has presented the whole in the form of a concise monograph.

The book is by no means a complete treatise on the subject; the sections on anatomy and physiology are necessarily mere outlines, but he has included some good diagrams and some very useful tables. The pharmacology is sketched mainly by means of a table. The pharmacodynamic tests and the visceral and dermal reflexes are dealt with in much greater detail. The chapter on the effect of the vegetative nervous system on the blood and circulatory system is particularly good; so also are those on vagotonia and sympathicotonia and on the clinical significance of the vegetative nervous system.

In one place the author displays his dislike for that pariah amongst scientists, the statistician. In discussing the significance of the blood count, 'I do not agree', he says, 'with the investigators who demand that "special pains should be taken" in the count and demand that besides the physiological variations the personal equation of the individual worker, the mean error, and other statistical sources of error, should be taken into consideration. In my opinion all these precautions are unnecessary, because, after all, the blood picture is not such a standardized and sensitive test that errors of a few per cent are of significance', on account, we would add, of the personal equation, the mean error, and other statistical sources of error, if this last expression means sources of error pointed out by that tiresome fellow the statistician.

The book will be found invaluable to the physician who wishes to extend his knowledge on this important subject. It should also prove very useful to the medical investigator for ready reference for details of experimental methods. Both owe the writer a debt of gratitude for his presentation of the subject in so concise and easily assimilable a form.

L. E. N.

VASCULAR DISORDERS OF THE LIMBS DESCRIBED FOR PRACTITIONERS AND STUDENTS.—By Sir Thomas Lewis, C.B.E., F.R.S., M.D., D.Sc., LL.D., F.R.C.P. 1936. Macmillan and Company, Limited, London. Pp. xi plus 111. Illustrated. Price, 6s. 6d.

A few years ago the state of our knowledge regarding the vascular disorders of the limbs was very imperfect and much of what we considered formed the

fundamental truths has turned out to be fallacious. During the last few years considerable advances have been made in this subject, and the field of investigation is still a promising one, so that the near future should see extension and consolidation of the ground already gained.

Sir Thomas Lewis has himself done much towards establishing the advances already made and we could therefore ask for no more suitable guide in this matter. We hurry however to explain that this is not by any means an account of his, or his colleagues', investigations in this field, but is a presentation of the practical outcome of these investigations for the benefit of the student and the practitioner.

The new conception of the Raynaud phenomenon, a term applied to that group of pathological conditions of which the syndrome described by Raynaud is the type disease, is well brought out in this book. This is important in view of the misconception that successful surgical treatment of the condition is likely to engender. The improvement following sympathectomy is not produced by cutting off abnormal impulses from a normal limb, but by destroying the normal vasomotor tone which would be sufficient to close completely the lumen of abnormal peripheral arteries.

If Sir Thomas is in the first line of the present-day medical investigators, he is also in the first line of teachers and he presents his subject in the simplest of language with the minimum use of special technical terms which anyone with any experience of writing knows are so hard to avoid. The scope of the book is limited, but the field it covers is an important one that is attracting much attention at the present time. We can strongly recommend this book to the teacher of medicine and the practitioner.

L. E. N.

TEXTBOOK OF GYNÆCOLOGY.—By W. Shaw, M.D., F.R.C.S. (Eng.), F.C.O.G. 1936. J. and A. Churchill Limited, London. Pp. vii plus 588, with 4 plates in colour and 234 text-figures. Price, 18s.

DR. SHAW has written a textbook for students on lines that are new. 'More stress has been laid upon anatomy and physiology than has been the practice in most recent textbooks of gynæcology, because it is believed that future advances are most likely to emanate from these sources'.

Although detailed pathology has been omitted (and will be welcomed by students) the author has taken care that a student will be well acquainted with all relevant pathology.

The first 100 pages (one-fifth of the book) are devoted to the foundation subjects of anatomy, histology and physiology. This section is profusely illustrated and lucidly described. If a student will thoroughly master these pages, he can pass on to the clinical sections, sure of his foundations. In these clinical sections the author writes in a restrained fashion for his reader—a judicious blending of history, clear discussion of theories and an endeavour to find a logical cause for signs, symptoms and treatment, an endeavour to simplify the subject according to modern knowledge, provides chapter after chapter of interesting and easy reading.

The book is an exposition of modern knowledge in a simple form. Sections on contraception and birth control are included, and there is an admirable chapter on x-rays and radium.

An unusual feature is the inclusion of abortion. As it is a condition so commonly found complicating gynæcological diseases, its inclusion is logical and welcome.

It is difficult to pick out any outstanding chapter, as the book is of a high level throughout.

Sound principles of treatment are advocated, and two are well worth assimilating, i.e., unjustifiable surgical intervention is not perhaps better illustrated than by some operations for retroflexion of the uterus, and 'One of the first principles in the treatment of abortion is to avoid interference except when active interference is clearly indicated'.

The author is to be congratulated on producing a textbook which should be of the greatest value to students.

S. N. H.

CARDIAC OUTPUT AND ARTERIAL HYPERTENSION.—By Sidney A. Gladstone, M.D. 1935. Published by Sidney A. Gladstone, M.D., 2, East 94th Street, New York City. Pp. 56. Illustrated. Price, \$1.00

THE publication comprises four papers. In the first paper a foreign-gas method for the determination of the cardiac output, which avoids error due to re-circulation, is described and has been shown to yield an arterio-venous oxygen difference of 49.0 c.cm., a result which compares favourably with average of 47.4 c.cm. and 49 c.cm. obtained by indirect Fick method and 52.8 c.cm. obtained by direct cardiac and arterial puncture in man.

In the second paper the author studies changes in gaseous concentrations, respiratory quotient and total volume of gas mixture in the lung-bag system.

The third paper deals with investigations in cardiac output and work of the heart in arterial hypertension performed in collaboration with Dr. Simon Dack. The authors find that essential hypertension may be present without any significant deviation of the cardiac output from the normal and that in nephrogenic hypertension the cardiac output may be 10 per cent above normal. The last article is on the pathogenesis of nephritic hypertension and the renal factor in the regulation of the arterial blood pressure. In this the author propounds a tentative and self-regulating mechanico-chemical theory.

The author traverses a highly controversial and immensely difficult ground. Uniformity of results as well as correct evaluation are almost impossible. In almost all investigations of this nature the methods employed are by no means perfect, basal conditions are difficult to obtain and nervous and hormonal imbalance are unavoidable. Personal equation, different tissue lability, highly technical nature of all the stages of the experimental procedure, all come to play their part in the field. However, there can be no doubt about the merit of the papers. They show technical skill, clarity of vision and indomitable patience. The author is congratulated on the production of these highly meritorious papers.

P. D.

THE EXTRA-OCULAR MUSCLES: A CLINICAL STUDY OF NORMAL AND ABNORMAL OCULAR MOTILITY.—By L. C. Peter, A.M., M.D., Sc.D. Second Edition. 1936. Henry Kimpton, London. Pp. 351. Illustrated with 136 engravings and 5 coloured plates. Price, 21s.

THIS is the second edition of Dr. Peter's classical work on the extra-ocular muscles. The sub-title is:—'A clinical study of normal and abnormal ocular motility' and this is exactly what the author has succeeded in presenting.

The first chapter deals fully with the anatomy and physiology of these muscles. It is beautifully illustrated, many of the illustrations and most of the text being borrowed from Whitnall's *Anatomy of the Orbit*. This greatly enhances the value of this chapter.

In the following chapters very little material alteration has been made and the advances made in recent years have been added. It is very useful to have the special terms—used for the various ocular movements—so clearly defined.

A most valuable chapter has been added dealing with surgical technique. Only such operations are described which the author has found from his large experience to be safe and satisfactory. Some are original and the others have been copied from other surgeons. The most minute detail is gone into including preparation of the patient, choice of anæsthetic, operating room technique, and the description and illustration of instruments, sutures and needles.

The last chapter is devoted to nystagmus and is well worth reading. No practising eye surgeon can afford to be without this book.

H. S. C.

THE ADRENALS.—By Arthur Grollman, Ph.D., M.D. 1936. Baillière, Tindall and Cox, London. Pp. xii plus 410. Illustrated. Price, 22s. 6d.

THE adrenals, although discovered as early as 1564, were not known to have any function until the classical work of Addison in 1855. Since then, however, these glands have been the object of intensive research and the mass of literature collected up to date is simply overwhelming.

In the present volume, the author has made a successful attempt to analyse the great accumulation of literature, to weed out those which are undesirable or obsolete, and to present a working hypothesis for the benefit of the reader.

In describing the anatomical and histological structure of the adrenals, the author has taken the view that the suprarenal glands in man in early life (and also in certain animals) are composed of three distinct physiological entities, instead of the hitherto described two portions, viz, the cortex and medulla. This newly described third type of tissue has been designed as 'embryonic' adrenal tissue which appears to be cortical tissue not only in its morphological and histological properties but also in the fact that it normally exists only during a certain period of life.

This tissue appears to be closely related to the gonads and its hypertrophy under certain pathological conditions (e.g., tumours) in the human being gives rise to a symptom-complex characterized by the masculinization of the female—a *syndrome* which was previously attributed to a hyper-function of the adrenal cortex, with the elaboration of an excess amount of hormone, specific to the cortical tissue. The views of the author appear, *prima facie*, to be well considered and we are inclined to agree with him in the hope that this will stimulate further studies in the subject, specially on the relationship of this newly described 'androgenic' zone of the adrenals to the adreno-genital syndrome. Pathological studies of the tumours which give rise to this syndrome and efforts to differentiate such tumours histologically from true cortical tumours are important problems which future investigations will probably decide.

The book contains a mass of useful information and is a valuable contribution to our present-day knowledge of the adrenal glands and should, we feel sure, be greatly appreciated by those who want to get up-to-date knowledge on the subject of endocrinology.

J. P. B.

SYNOPSIS OF CLINICAL LABORATORY METHODS.—By W. E. Bray, B.A., M.D. 1936. The C. V. Mosby Company, St. Louis. Pp. 324 with 32 text illustrations and 11 coloured plates. Price, \$3.75

THIS is a remarkable little book. It seems to contain far more than the average book on clinical laboratory methods and yet it is a book that can easily be carried in the pocket; this has not been achieved by the use of small print, nor by the omission of plates and diagrams. The information throughout seems to be quite up to date and even workers outside the States have been quoted.

The hæmatological section seems to be particularly good; there are some very instructive diagrams and a coloured plate. In the plate showing malarial parasites the figures are a little too small to be really useful, but at least they are not misleading. Amongst the figures that puzzled the reviewer, they turned out to be 'a macrophage containing pigment' and 'the section of a brain capillary showing pigment'; for the latter explanation we accept the author's word.

There is an excellent plate of helminthic ova from the stools, and these are also well described in the text, but there is no reference to *Ancylostoma duodenale*; *Necator americanus* only is mentioned. There is an accurate differential table of *Entamoeba histolytica* and *coli*, though the spelling *Endameba* is used.

For pregnancy tests Friedman's method is given, and here again there is a useful coloured plate.

It is a book that we can strongly recommend for students and practitioners in this country.

L. E. N.

THE MICROSCOPIC ANATOMY OF VERTEBRATES.

—By George G. Scott, Ph.D., and James I. Kendall, Ph.D. 1935. Henry Kimpton, London. Pp. 306. Illustrated with 167 engravings. Price, 17s. 6d.

As a textbook on elementary histology this volume offers to both medical and veterinary students a very precise and accurate description of the component tissues of the vertebrates without going into elaborate—and sometimes unnecessary—discussion of controversial and undecided points on classification and genesis of the tissue elements. The picture of tissue sections as seen through a microscope is that of a plane flat surface with no indication of solidity or the third dimension of depth. The authors have very successfully dealt with this extremely difficult task of conveying the idea of solidity to the student microscopist by means of diagrams and drawings (all of which are original)—which, to say the least, will probably be of immense value even to a histologist of experience. The excellent reproduction of the photomicrographs speaks well of the printing attainments. In spite of these being only black and white pictures, they are clear and accurate enough to be used as ready references to the study of structural details of actual specimens given out in the practical class.

The chapter on embryology is admirably written in so far as it contains 'just enough' for the student, and for those who intend going in for higher studies in the various branches of the subject the bibliography is appended to the end of each chapter. The entire book has been written in a simple style with a refreshingly happy selection of expressions which does not leave a vague and nebulous impression in the mind of the primary student. There is a slight suggestion of dogmatism which is both unavoidable and beneficial to the beginner in stabilizing his basic knowledge of the subject.

The last chapter of the book deals with laboratory technique wherein are embodied methods of collection of material for histological studies, methods of fixation, handling and preparation of tissues for paraffin or celloidin imbedding, sectioning and staining by simple standard methods.

BHARATIYA BYADHI O ADHUNIK CHIKITSA (WRITTEN IN BENGALI).—By Pashupati Bhattacharya, D.T.M. Part I. Published by the Book Company, Limited, Calcutta. 1936. Pp. 727 plus 16. Illustrated. Price, Rs. 6

THE author proposes to publish his work in two volumes of which the book under review is the first part. It mainly deals with fevers specially prevalent in Bengal and in India generally, and he gives clear, comprehensive and up-to-date descriptions in a language which is at once beautiful and convincing. Much of the information embodied herein is, indeed, very recent and bears the mark of his indefatigable labour and studies.

The chapter on the management of fever cases in general is admirable. Even an ordinary layman will read it with great profit.

Malaria, kala-azar, and enteric fevers, among others, have been systematically presented, details of the history, ætiology, geographical distribution, symptomatology, pathology, diagnosis, preventive measures and treatment being given in full. The author's exposition is a marvel of compression of facts and a fine digest of the most up-to-date researches.

A satisfactory feature of the book is that it lays the right emphasis upon the laboratory diagnosis of diseases, doing ample justice to some of the most modern technique.

Last, but by no means least, is the very useful and informative section on modern microscopy.

The work is, of course, not without its minor defects; while discussing the merits and demerits of atebirin the author states that it kills only the asexual forms of malaria parasites and does not act on the gametocytes; hence the atebirin therapy should be followed by a course of plasmoquine. This is not quite correct. Atebrin like quinine affects both sexual and asexual forms of *P. vivax* and *P. malariae* and the sexual forms of *P. falciparum* and has no action only on the gametocytes of the last-named species. Another mistake occurs on p. 677; it was Robertson and not Carter who named the organism of rat-bite fever *Spirillum minus* long after Carter had discovered it. There are also a few misprints. These errors, however, in no way detract from the merit of the work.

The author has written his work in his mother tongue Bengali, and his effort to popularize the wealth of medical information among his people is really laudable and should deserve the warm support of the public. The reviewer wishes to congratulate the publishers on the excellent get-up of the book. The index will prove very useful.

B. M. D. G.

PREVENTIVE MEDICINE.—By M. F. Boyd, M.D., M.S., C.P.H. Fifth Edition. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 561, with 155 illustrations. Price, 20s.

THIS is the fifth edition of this book to appear since 1920, so it is obviously a popular publication. Perusal of its pages offers an ample explanation of its popularity, for it is a well-arranged and clearly-formulated statement of the essentials of preventive medicine both as applied to specific diseases and matters of general importance to health such as sewage disposal, and water supplies.

In these important adjuncts to health the individual householder in rural areas has not been forgotten, for information as to how to collect and safely store water under these conditions is described as well as the elaborate and expensive means that are only possible to large corporations, and the same can be said of the advice regarding the disposal of night-soil and other refuse.

Milk production and distribution are also well described and considerable space is devoted to the subject of food values and nutrition in the production of disease. Occupational diseases and the simple statistical examination of figures are also discussed.

The above remarks only touch on the principal features of the book, it is so complete that it would not be possible to mention them all in a short review. The arrangement of the subject-matter, usually under definite heads, the same heads being employed in every case, makes it an excellent book for students and it is as a textbook for use in preparing for a public health examination that its greatest value will be found. But it will also be of value as a book of reference for a health officer, as where to amplify the more or less summarized information in the book can be easily ascertained from a list of useful references in the appendix.

Nearly all the illustrations, spot maps and figures quoted as examples emanate from the United States, but in this instance this is not a serious defect as they may be applied to practically any other part of the world. It is a disappointment, however, to a worker in the tropics to find no mention of trypanosomiasis and tsetse flies nor of kala-azar and sandflies including sandfly fevers. These are omissions that will be felt by workers in at least two large tracts of the tropics and sub-tropics, which we consider should be rectified

in the next edition, to make the book a complete exposition of the subject of preventive medicine.

P. A. M.

MEDICAL RESEARCH COUNCIL. 'THE COURSE OF THE OESOPHAGUS IN HEALTH, AND IN DISEASE OF THE HEART AND GREAT VESSELS'.—By W. Evans. Special Report Series. No. 208. 1936. Published by His Majesty's Stationery Office, London. Pp. 93. Illustrated. Price, 2s. 6d.

'The oesophagus, or gullet, passes through the chest in its whole length and in so doing lies in close proximity to the heart, the great blood vessels, and the roots of the lungs. It is moulded against these and against other structures; its form is in part determined by them and changes when they change their outline, as they often do in disease. These facts have long been known.

It has also been known that the form of the gullet can readily be ascertained in the living subject by rendering it opaque to x-rays, as when a paste of barium salt is swallowed. The gullet can be made to signal changes in the shape of neighbouring organs in this way; thus, distortion of the gullet is known to happen in aneurysmal enlargement of the aorta. But this method of studying the forms of organs pressing against the gullet, and changes in these forms consequent upon disease, has not been used to full advantage. The necessary information, previously lacking or else unavailable in practical form, has been supplied by Dr. Evans, who has brought together previous observations and his own extensive and precise studies.

These studies of Dr. Evans begin by noting in detail the normal contours of the gullet, and explaining all its curves in terms of surrounding structures. They continue in a display of exaggerated or abnormal indentations brought about by enlargement of various surrounding organs. The distortion of the oesophagus caused by gross aneurysms of the aorta is a distortion variable in form and in degree; but in less advanced disease and in diseases other than aneurysm, as Dr. Evans shows, minor distortions of more fixed pattern occur, and these are of value in early diagnosis. The method is also one which permits progressive morbid changes to be gauged, from time to time, in an unusually accurate manner.

The matter is presented very clearly. There are twenty-five pages of textual description, which commences with a few details of the methods adopted in the investigation.

The main bulk of the report however consists of 63 full-page 'figures' on art paper; these figures consist of two parts, one a tele-radiogram and the other a line drawing demonstrating the points of the radiogram.

The report now that it is available forms an essential unit of the library of the up-to-date radiologist, as nowhere else is the information that it contains to be found.

MEDICAL RESEARCH COUNCIL. 'BACTERIAL NUTRITION: MATERIAL FOR A COMPARATIVE PHYSIOLOGY OF BACTERIA'.—By B. C. J. G. Knight. Special Report Series, No. 210. 1936. Published by His Majesty's Stationery Office, London. Pp. 182. Price, 3s.

'GREATER knowledge of the conditions which govern the growth and multiplication of bacteria is a fundamental necessity for the better understanding and control of various infectious diseases and of morbid states involving sepsis. These conditions, either favouring or inhibiting bacterial growth, should be largely definable in chemical or physico-chemical terms, and the importance of the study of bacterial chemistry is therefore apparent'. For this reason the Medical Research Council has always encouraged research on this subject and has recently established a special department for research on bacterial chemistry. The author of this report is a Halley Stewart research scholar working with Dr. Paul Fildes, director of this research department.

'After an introductory section, the first and longest part of the report gives a systematic survey of the known facts. The second part deals with the data in the light of the hypothesis that the different types of nutritive requirement exhibited by bacterial species may be regarded as successive levels in an evolutionary scale. At the bottom are those forms which can multiply and grow at the expense of relatively simple chemical substances and can thus satisfy their food requirements throughout a wide range of environmental conditions. The higher forms are those which either have more elaborate requirements or have lost some power of synthesizing necessary compounds from simple sources: they have adapted themselves to the use of more complex food substances, but in becoming more exacting in their demands they have also become more dependent upon a specialized environment. According to this view, the emergence of parasitism as a characteristic of some bacteria may be supposed to have taken place along those lines. The third part of the report deals with the ways in which bacteria can adapt themselves to changes in nutritional conditions'.

THE EYE AND ITS DISEASES.—By 82 International authorities. Edited by C. Berens, M.D. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 1254 with 436 illustrations. Price, 50s.

THE author modestly claims that the book represents an effort to present 'the essentials of ophthalmology to physicians, surgeons, neurologists, medical students and those entering upon the practice of ophthalmology'. It does more than this. It constitutes an excellent book of reference to all who are already engaged as eye specialist and should find a place in every library that caters for ophthalmic science.

It is original in its method of subject presentation, the various chapters having been written by 82 well-known ophthalmic specialists from different parts of the world. This gives a variety and elasticity and permits of introducing the readers to recent work and matters still under investigation which stimulate his interest. It would be impossible to review such an extensive volume in any sort of detail and invidious to single out special chapters for criticism. In the assemblage of individual contributions which go to make up this valuable work each of the various types of readers for which it is intended will find something of peculiar value and interest. Ophthalmologists will be struck with the practical detail and method of presentation of the various sections dealing with refraction and motor anomalies—the routine work of his special subject. The diseases of the cornea are dealt with in a way which will only be fully appreciated by the eye specialist and takes up over 100 pages. Turning from these one realizes that certain chapters are thin by contrast. There is, thus, as could only be expected in such an extensive collection of individual communications, an element of disproportion and also a certain amount of overlapping.

Although not especially designed for the ophthalmic specialist this book will probably achieve its greatest usefulness as a very welcome volume of special reference in addition to those already on his shelves. It is likely, in India at all events, that ophthalmic specialists, young and old, will value the vitality of many of its chapters, the references to literature, and its index, more than any other members of the profession. Readers in India and possibly other parts of the tropics may feel inclined to criticize certain shortcomings in so far as their particular outlook is concerned. No doubt there are shortcomings and omissions, and a relative scantiness of space in connection with certain tropical matters which are of such familiarity to workers in the East as to assume comparative importance in their eyes. This however will not diminish the value of the work for them. The personal element and individual experience introduced into numbers of the chapters by distinguished authors is an interesting feature, giving a freshness which differs from the textbook handling of the particular subjects dealt with. Dr. Berens is to be

congratulated in having obtained and successfully assembled such a large number of individual contributions and welded them into a harmonious whole. The result of his labours and those of his collaborators is

a most commendable addition to existing ophthalmological records. The book is assured of a good reception.

R. E. W.

Abstracts from Reports

THE ROCKEFELLER FOUNDATION: ANNUAL REPORT FOR THE YEAR 1935

INTERNATIONAL HEALTH DIVISION

Public health: General programme.—The year 1935 was a significant one in the history of the public health work of the Rockefeller Foundation, since it marks more sharply than any other year the shift in programme from the old to the new. This transition has not been an abrupt one. It began some five or six years ago and is not yet wholly ended, but, in general, 1935 may be considered as marking the completion of one phase of the work.

The dominant feature of the former world-wide programme was the creation and development of technically competent local, state, and national health services. This was the outcome of the still earlier hookworm work, which led to an interest in the formation of well-rounded health departments which would include the control of hookworm disease and similar types of public health work as an integral part of their regular health-protection programmes. In the majority of countries in which the Foundation has been active, demonstrations have now been made to show the feasibility of this sort of administrative machinery in applying existing knowledge for the advancement of public health.

The demonstrations in which the Foundation has participated, and the ever-increasing application of present-day methods by governments, have undoubtedly greatly extended the benefits of public health service, but at the same time they have brought out, as nothing else could have done, the very real limitations of existing knowledge and particularly its frequent inadequacy when applied to specific problems under special conditions. Through experience it has become apparent that the Foundation can render its greatest service in the public health field by shifting its emphasis from the rapid and extensive application of existing knowledge to the securing of additional facts necessary to effective and economical control of disease. The changed programme still includes extensive co-operation with governments in disease control by means of demonstrations and supplying the services of experts, but the important preceding and concurrent critical studies have been extended and intensified and the resulting observations made widely available.

The dominant feature of the new programme is field research, through which it is hoped to arrive at the control of certain specific diseases. Among the diseases studied in 1935 yellow fever heads the list; malaria likewise occupies a position of major importance. Significant contributions were, however, also made in schistosomiasis, yaws, tuberculosis, undulant fever, and other diseases.

The attempt is not made to engage in research on all the diseases in the field of public health. Efforts are concentrated on a limited number of clear-cut public health problems, with emphasis on the need for studies of disease in its environment and on closely related laboratory investigations, in order to define the problems with greater accuracy and to search for more effective and less expensive methods of disease control.

Whether the Foundation concentrates on administrative procedures or on the advancement of knowledge in public health and hygiene, the matter of public

health education cannot be neglected. For this reason advancing the education of public health officers and nurses through a fellowship programme and aid to institutions receives continued attention. Provision of opportunity for the field practice required by schools of hygiene is also a feature which is still emphasized in the Foundation's programme. It is the need for such field centres which has led to co-operation in the establishment of a number of new health centres in Europe and elsewhere.

Yellow fever: Geographical spread.—Ten years ago yellow fever was believed to be restricted, as far as the South American continent was concerned, to a district in the north-east of Brazil, and to be rapidly disappearing as a result of antimosquito services in a few of the larger cities. It is now realized that yellow fever is widely disseminated over the continent east of the Andes and north of Paraguay, and the hope that the disease might shortly be brought under control or disappear has been deferred. Ten years ago yellow fever was regarded as an urban disease transmitted by *Aedes ægypti*, a mosquito living and breeding almost entirely in houses, whereas to-day it is known that yellow fever is widespread in the interior and occurs as a jungle disease hundreds of miles away from the nearest *Aedes ægypti* habitat.

There were a number of outbreaks of disease that looked like yellow fever at unexpected places between 1930 and 1935, but its discovery in Goyaz and elsewhere in south central Brazil in 1935 was one of the dramatic events in epidemiology. The area in Goyaz was one in which yellow fever had never previously been reported; it was investigated simply in order to complete a survey. By accident one of the doctors making the survey had a conversation with a local practitioner who mentioned that from up-country there had come a fatal case of malaria with some unusual features. On going into the district concerned many other cases of yellow fever were discovered in a stretch of country extending over one hundred thousand square miles. This was country which could not be considered jungle or wild territory, because it contained towns with populations of over thirty thousand, but the strange thing was that the disease did not come into the towns.

It was soon observed that this was the type of yellow fever which has been designated 'jungle yellow fever', initially described and discussed in the Rockefeller Foundation Annual Report for 1934. The definition of jungle yellow fever has had to be widened. Jungle yellow fever may be defined as yellow fever occurring in rural, jungle, or fluvial zones in the absence of *Aedes ægypti*. Jungle yellow fever has now been observed long and thoroughly enough for its clinical identity with the type transmitted by *Aedes ægypti* to be firmly established. The virus in jungle cases when inoculated into mice or monkeys gives exactly the same results as does the urban virus. The characteristic difference between jungle yellow fever and the yellow fever of the urban type transmitted by the *ægypti* mosquito is that the former is acquired away from houses, whereas the latter is transmitted by a domestic mosquito and contracted in the house itself. This gives rise to an entirely different distribution of cases in the population. The urban fever occurs to about the same extent among females as among males, but the jungle fever is much more common among men. In the jungle cases the peak of distribution occurs at about the age

of twenty-five, while in the urban type people are attacked at all ages.

During the year there was published further information on a general survey of the continent of Africa with regard to the geographic distribution of yellow fever. In Africa, yellow fever immunity in man, as determined by blood tests in mice, is widely but irregularly distributed in a region extending from the coast of Senegal eastward for approximately 3,300 miles to the upper reaches of the White Nile in the Anglo-Egyptian Sudan. The northern limit of this region is the Sahara desert. The western and southern boundaries follow the coast of the Atlantic Ocean from Senegal to the extreme northern part of Angola and then turn eastward across Angola and the southern part of the Belgian Congo. The region has a maximum width of about 1,400 miles and lies between the latitudes of 16° North and 6° South. Human blood specimens from localities scattered throughout the parts of Africa lying outside of this region were found to be without power to protect mice against yellow fever virus except in a few rare instances which may be explained without invalidating the general rule. The region thus delimited may be considered as endemic in the sense that the infection is always present and widely distributed. This is the endemic region of the Eastern Hemisphere. It is one of the two great endemic regions of the world, the other being the one in South America discussed above.

The African yellow fever region may be divided into two parts. There is a western area which extends to the eastern border of Nigeria and includes also the coastal regions from Nigeria to Angola. This western area has had numerous epidemics of yellow fever, both on the coast and in the interior, and is still having them. In the eastern area, which includes the remainder of the endemic region, the situation is radically different. Yellow fever, outside of perhaps a single sporadic case, has never been recognized there. It is possible that we may here be dealing with strains of yellow fever virus which differ from those in classic epidemics by having a lowered virulence or a lack of selective localization in vital organs. There may be environmental conditions similar to those responsible for the perpetuation and limitation of the jungle yellow fever now being studied in South America. This eastern zone of high prevalence of yellow fever infection as indicated by resulting immunity requires further intensive study.

Control and vaccination.—As far as the jungle variety of yellow fever is concerned, there has been up to now little to offer in the way of control. Vaccination gives some hope for the protection of the individual, but as a means of controlling the disease it is as yet out of the question. Until more is known of the source of infection in the jungle and the mechanism of its transmission from such a source to man, a programme for control cannot be drawn up.

But yellow fever in the cities can be prevented through mosquito control, and methods in Brazil have been so greatly perfected during the past two years that the control of *Aedes aegypti* in urban districts can now be carried out at a fraction of the cost of five or ten years ago. In the earlier days of anti-*aegypti* work it was found that if the breeding index, or the proportion of houses in which larvæ could be found, was brought down to 5 per cent or lower, yellow fever spontaneously disappeared from the community. But the attempt to reduce the breeding index to zero was frustrated by enormous expense. Until recently routine practice was able to bring the breeding index down to 2 or 3 per cent, but latterly it has been found economically possible to bring it down practically to zero. In Rio de Janeiro, with a population of over one and a half million, and with 270,000 houses containing millions of potential breeding places, it is now possible to go for weeks at a time without discovering a single stegomyia mosquito; when such a mosquito is discovered, it is along the waterfront or railway line, indicating the reintroduction of the species rather than previously undetected breeding places.

Most of the activities of yellow fever investigation at the laboratories of the Rockefeller Foundation in New York City were concentrated in 1935 on improving the method of vaccination in order to make immunization more practical and more readily available to large populations. Encouraging results were obtained in the prolonged cultivation of yellow fever virus in tissue cultures for the purpose of reducing its virulence without altering its valuable antigenic properties.

Although the virus grown in tissue cultures loses much of its initial virulence, and is used at present for human vaccination in place of the highly-neurotropic mouse-passage virus previously employed, it is still considered unsafe for use in human vaccination without simultaneous protection with immune serum. In the past, immune human serum has been used exclusively for this purpose. The use of this human serum makes the application of human vaccination on a large scale impracticable, as few persons maintain a highly protective serum in their blood for a long period of time after recovering from the disease. Moreover, as such serum must be purchased from donors, the cost of a single vaccination is high. In order to obtain a more practicable source of immune serum for vaccination purposes, an investigation was undertaken to determine the feasibility of using goats for the production of yellow fever antiserum. Results were sufficiently encouraging to warrant undertaking the production of immune goat serum on a larger scale. The goat serum was tried on two members of the laboratory staff and in both instances severe urticaria and local oedema resulted. Further work was undertaken on this serum for the purpose of reducing its toxicity and concentrating the immune substances to reduce to a minimum the amount of foreign protein injected in vaccination. The results achieved indicate that the serum still gives undesirable reactions, although much milder than those caused by untreated goat serum.

Concurrently a study was undertaken to determine whether a hyperimmune serum could be produced in monkeys. By using the general technique employed in producing a high potency serum in rabbits, it was possible to obtain from monkeys a serum found to have a protective power over twenty times as great as that of the human immune serum previously used for vaccination purposes. Four cubic centimetres of this serum were considered sufficient to allow an ample margin of safety in the vaccination of an adult of average weight. This new type of serum is at present being used on a fairly large scale in Brazil for vaccination under field conditions. The results in the laboratory using tissue culture virus together with this serum were highly satisfactory, in that good immunity, with little adverse reaction, was obtained. Reports from Brazil on its use under field conditions have been similarly gratifying.

Malaria.—What can be done when efforts against malaria are exerted faithfully from year to year is shown by the following table with regard to work at Fiumicino, Italy. The table covers fifteen years, from 1921 to 1935. Antimosquito work was begun in 1926. The figures indicate that mosquitoes gradually disappeared, that malaria was vanquished, and that the population of the town increased until it has now become a prosperous summer colony.

The work at Fiumicino was in the nature of a strictly local demonstration. The Foundation makes no attempt to aid in combating malaria throughout the length and breadth of any country. Certain restricted areas are selected to show what, if anything, can be done to control malaria by methods adapted to that locality and within the means of the population concerned. Since work is undertaken only in co-operation with the local authorities or government the result of these demonstrations usually is that further work along the same lines is incorporated as a part of government activities.

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Various experiments were carried out in Portugal in an effort to arrive at a satisfactory control of malaria in the rice-fields. The attempt was made to provide surrounding barriers of animals to draw off the mosquitoes as a protection to the population, but this was unsuccessful. It is believed that the local race of *Anopheles* prefers sheltered feeding to feeding in the open, and that this is one of the reasons why these animal barriers (rabbits and pigs) gave but little protection. Screening experiments were also carried on. Work is under way and further experiments are to be made in the biological control of malaria. Extensive field studies of rice-fields and malaria are likewise being continued in Petritch, Bulgaria.

During the year there were completed four years of successful malaria control by antilarval measures in Spain. The original objective in setting up a station at Campo Lugar, Cáceres, Spain, has been attained. In Greece the year 1935 brought to an end five years of successful antilarval field studies in a rural and an urban area; co-operative antilarval demonstrations were continued in three other regions for another year. A screening demonstration was continued effectively for the fourth year. The antimalaria drainage project carried out in 1932 in the Nea Macri area of the Marathon plain continued to show a decrease in malaria and anophelism.

A simple method has been devised for detecting the eggs of *Anopheles* in the breeding places of mosquitoes. A bag of white cloth is worn on the left hand; the surface of the water is skimmed with a pan, and the contents of the pan are strained through the mitten. The material collected on the mitten is examined immediately with a hand lens. The usefulness of this method is greatest in regions where the eggs of *Anopheles* are easily identified. In parts of Europe where *A. clutus*, *A. maculipennis*, and *A. superpictus* are found, the method has proved very practical.

Hookworm and schistosomiasis.—In former years the Rockefeller Foundation engaged extensively in work connected with the investigation and control of hookworm disease. This work was carried on in many countries in the tropical and semi-tropical belt encircling the world. Many cases were cured; numerous control campaigns involving preventive sanitation work were instituted; and, gradually, work against hookworm disease was incorporated in most countries as part of the regular routine of the health departments. At present the only regions in which the Foundation is still actively supporting hookworm work are North Carolina and Egypt.

The work in Egypt concerns a continued demonstration in the control of soil pollution. As is well known, the only effective way of preventing hookworm disease is to prevent soil pollution by human excreta. This involves the provision of sanitary latrines and an educational campaign to inculcate their use. In Egypt an effort is being made to sanitize three villages in each of the fourteen provinces and three governorates of the country. If the present rate of progress can be continued, the programme will be completed by the end of 1936. In Egypt a change in the habits of the people living in villages in rural areas is already noticeable. Practical sanitation is being achieved.

During 1935 there was also completed a helminthological survey of Egypt, in which at least 40,000 representative individuals were investigated through a microscopic examination of over 150,000 slides containing stool specimens. Originally this study was planned as an attempt solely to evaluate the effect of sanitation with bored-hole latrines by studying worm parasite infestation, but as the survey proceeded it supplied in addition a knowledge of the distribution of various parasites over the country as a whole. It revealed the differences of infestation level which might occur even within small areas. It indicated the natural variability of infestation level from year to year and with the different seasons of the year. From this survey, which has extended over a period of six years, a good idea can be obtained of the helminthological or worm parasite infestation in the country.

For the past five years the Foundation has also been co-operating with the government in Egypt on the problem of schistosomiasis. Before the problem of schistosomiasis can be solved, the snail problem must be understood. Little has been known about snails as carriers of disease, but the work has now reached the stage where it seems that canal clearance offers considerable hope for ridding irrigation canals of snails. Control of the snail and thereby of schistosomiasis lies uppermost in the minds of many workers in the field of medical research in Egypt. It is thought that in a vigorously conducted attack on the intermediate host lies the best possibility of success.

Tuberculosis.—At three places in the United States, in Jamaica, and in Austria the Foundation has aided tuberculosis work.

Other diseases.—Foundation aid to a diphtheria research programme in Eisenstadt began in 1933. Successful initial work against diphtheria by immunization with formol-toxoid, authorized in Austria in 1935, led to an active campaign enlisting the co-operation of physicians, public health workers, county officials, and health supervisors. The research programme was practically completed by the end of 1935. In the coming years it is intended to extend this immunization to all parts of the country.

During 1935 funds were designated for diphtheria research in Peiping, China. A member of the staff of the International Health Division of the Rockefeller Foundation acted in an advisory capacity in connection with this research programme.

In 1932 the Foundation began to conduct co-operative studies in Jamaica to devise effective methods for the control of yaws. In a district with a high incidence of yaws intensive studies were made of the onset, symptoms, course, and spread of infection, using different drugs under careful control in the treatment of the

of twenty-five, while in the urban type people are attacked at all ages.

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A simple method has been devised for detecting the eggs of *Anopheles* in the breeding places of mosquitoes. A bag of white cloth is worn on the left hand; the surface of the water is skimmed with a pan, and the contents of the pan are strained through the mitten. The material collected on the mitten is examined immediately with a hand lens. The usefulness of this method is greatest in regions where the eggs of *Anopheles* are easily identified. In parts of Europe where *A. efusus*, *A. maculipennis*, and *A. superpictus* are found, the method has proved very practical.

Hookworm and schistosomiasis.—In former years the Rockefeller Foundation engaged extensively in work connected with the investigation and control of hookworm disease. This work was carried on in many countries in the tropical and semi-tropical belt encircling the world. Many cases were cured; numerous control campaigns involving preventive sanitation work were instituted; and, gradually, work against hookworm disease was incorporated in most countries as part of the regular routine of the health departments. At present the only regions in which the Foundation is still actively supporting hookworm work are North Carolina and Egypt.

The work in Egypt concerns a continued demonstration in the control of soil pollution. As is well known, the only effective way of preventing hookworm disease is to prevent soil pollution by human excreta. This involves the provision of sanitary latrines and an educational campaign to inculcate their use. In Egypt an effort is being made to sanitize three villages in each of the fourteen provinces and three governorates of the country. If the present rate of progress can be continued, the programme will be completed by the end of 1936. In Egypt a change in the habits of the people living in villages in rural areas is already noticeable. Practical sanitation is being achieved.

During 1935 there was also completed a helminthological survey of Egypt, in which at least 40,000 representative individuals were investigated through a microscopic examination of over 150,000 slides containing stool specimens. Originally this study was planned as an attempt solely to evaluate the effect of sanitation with bored-hole latrines by studying worm parasite infestation, but as the survey proceeded it supplied in addition a knowledge of the distribution of various parasites over the country as a whole. It revealed the differences of infestation level which might occur even within small areas. It indicated the natural variability of infestation level from year to year and with the different seasons of the year. From this survey, which has extended over a period of six years, a good idea can be obtained of the helminthological or worm parasite infestation in the country.

For the past five years the Foundation has also been co-operating with the government in Egypt on the problem of schistosomiasis. Before the problem of schistosomiasis can be solved, the snail problem must be understood. Little has been known about snails as carriers of disease, but the work has now reached the stage where it seems that canal clearance offers considerable hope for ridding irrigation canals of snails. Control of the snail and thereby of schistosomiasis lies uppermost in the minds of many workers in the field of medical research in Egypt. It is thought that in a vigorously conducted attack on the intermediate host lies the best possibility of success.

Tuberculosis.—At three places in the United States, in Jamaica, and in Austria the Foundation has aided tuberculosis work.

Other diseases.—Foundation aid to a diphtheria research programme in Eisenstadt began in 1933. Successful initial work against diphtheria by immunization with formol-toxoid, authorized in Austria in 1935, led to an active campaign enlisting the co-operation of physicians, public health workers, county officials, and health supervisors. The research programme was practically completed by the end of 1935. In the coming years it is intended to extend this immunization to all parts of the country.

During 1935 funds were designated for diphtheria research in Peiping, China. A member of the staff of the International Health Division of the Rockefeller Foundation acted in an advisory capacity in connection with this research programme.

In 1932 the Foundation began to conduct co-operative studies in Jamaica to devise effective methods for the control of yaws. In a district with a high incidence of yaws intensive studies were made of the onset, symptoms, course, and spread of infection, using different drugs under careful control in the treatment of the

disease. The disease appears to be prevalent in Jamaica in districts having a high rainfall, a relatively impervious soil, and a population of low economic status living under insanitary conditions. On the entomological side, an investigation has been carried out demonstrating that *Hippelates* flies can carry yaws infection mechanically from man to rabbits.

The Rockefeller Foundation has given aid to the smallpox vaccine laboratory of the National Institute of Hygiene, Spain. At this laboratory there are under way important technical studies in connection with the cultivation of smallpox vaccine virus in chick embryo tissues. Co-operation in this vaccine work has been established with the authorities in Austria. The Spanish smallpox laboratory has furnished the Austrians a culture vaccine which is being tried out under field conditions. The work, therefore, is important not only for its influence in Spain but also for its influence outside of the country.

Work was started in November 1935 in connection with a field study of scarlet fever in Rumania. Headquarters have been established at Jassy.

After more than four years of investigation the co-operation of the Foundation in undulant fever work in southern France terminated in the autumn of 1935. The work will be continued under government auspices. Undulant fever in France is almost exclusively a rural disease occurring among individuals whose occupations bring them into direct contact with sheep, goats, or cows. The most hopeful solution appears to be the control of infection among animals through precautionary measures in breeding and raising them.

Studies of the viruses of the common cold and of influenza were pursued in 1935 along the lines of maintaining cultures in chick embryo tissue and using the cultured virus in experimental vaccination; and carrying on experimentation with a view to adapting the cultured viruses to various animals which might be useful in the laboratory in the study of influenza and the common cold.

[This abstract only deals with the work of the International Health Division of the Rockefeller Foundation. There are many other branches devoted to other aspects of medical and general science for which we regret we are unable to find room.]

TRIENNIAL REPORT ON THE WORKING OF THE HOSPITALS AND DISPENSARIES IN BIHAR AND ORISSA FOR THE YEARS 1932, 1933 AND 1934. BY COLONEL P. S. MILLS, I.M.S., INSPECTOR-GENERAL OF CIVIL HOSPITALS

REGARDING subdivisional hospitals endeavour is made to have all of them in charge of an assistant surgeon, but nine out of a total of 43 remain in charge of sub-assistant surgeons. These nine places are of lesser importance.

Owing to the lack of employment of medical graduates holding the degrees of M.B., B.S., local bodies are now employing some of these graduates in the dispensaries maintained by them in place of the licentiates, and if this system of recruiting the services of medical graduates continues in future and is adopted by all the local bodies in the province, the standard of medical treatment in these local fund dispensaries may improve.

The number of hospitals and dispensaries in Bihar and Orissa steadily increased during the triennium under review. It was 672 at the end of the previous triennium. This number increased to 675 in 1932 to 686 in 1933 and to 690 in 1934, the total increase during this triennium being 18.

At the beginning of the triennium there were altogether 5,803 beds (3,937 for males and 1,871 for females) in all classes of hospitals in the province, while at the close of the triennium the number of total beds stood at 5,837 (3,898 for males and 1,939 for females), the net increase being 29. In the State-public, local fund and private-aided hospitals however the total accommodation increased by 125 beds (38 for males and 87 for females).

The total number of patients treated both as inpatients and outpatients in all classes of hospitals and dispensaries in Bihar and Orissa numbered 7,250,123 in 1932, 7,089,290 in 1933, 7,029,694 in 1934 against 7,587,129 in 1931. The average number of patients treated each year during the present triennium was 7,123,036 as compared with 7,191,541 in the previous triennium.

Before the year 1932 medicine was given free of charge to every person attending at a dispensary personally or represented by friends and as this system did not touch the pocket of anybody, a large number of persons used to attend dispensaries for obtaining medicines for any and every disease, however trifling it might be, but in 1932 the rules regarding the supply of medicines from charitable dispensaries were revised, requiring all but the poor and really indigent either to subscribe to the dispensary or to pay for the medicines supplied to them at the rate of not more than one anna for each prescription at the local fund hospitals and dispensaries in rural areas and also at the municipal institutions where no suitable chemists' shops were available. The effect of the enforcement of this revised system of issuing medicines from dispensaries was that many who could afford to get on without medicines for ordinary maladies, stopped attending dispensaries to avoid payment on that account. The ultimate result of this has been the gradual decrease in the number of outpatients. This new system of making a small charge for medicine, generally half an anna, serves to keep away many who may attend unnecessarily. In actual practice very little money is realized on this account. As no fees are charged from inpatients, their number has increased steadily every year.

In the three years 1929 to 1931 cholera was so prevalent in the province that on an average 27,212 cases each year were treated in hospitals and dispensaries. In 1932 and 1933, the number of cholera cases similarly treated was only 3,684 and 4,211, respectively. The considerable decrease in these two years was due apparently to the smaller prevalence of this disease in those years. In 1934, however, the number increased to 19,873. In the Puri cholera hospital, which is a special hospital intended for the treatment of cholera cases as inpatients only, 183 were treated in 1932 with 18 deaths, 90 with 10 deaths in 1933 and 233 with 33 deaths in 1934.

The total number of deaths from cholera in the whole province was recorded at 9,348 in 1932, 17,514 in 1933 and 57,289 in 1934 as compared with an average of 100,064 in the previous triennium. Formerly cholera was spread by the collecting together of large numbers of pilgrims at holy places, at fairs, melas, etc., but this disaster is now much decreased by the arrangements made for pipe water-supplies and general sanitation made by the Public Health Department.

Cholera bacteriophage has been extensively used and is believed to have achieved very useful results by some of those using it.

The number of deaths from smallpox amongst the general population increased from 8,028 in 1931 to 16,466 in 1932, to 42,674 in 1933 and to 30,310 in 1934. The number of patients treated in hospitals and dispensaries was 1,249, 1,173, 1,472 and 1,068, respectively. In the year 1933 smallpox was severe. The urban areas suffered more than the rural areas.

The mortality from plague in the province was 3,374 in 1932, 1,635 in 1933 and 5,411 in 1934 against an average of 5,933 in the preceding triennium. The corresponding number of admissions in hospitals and dispensaries was 911; 493; 1,164 and 1,626. There are certain isolated tracts in the districts of Saran, Champaran, Muzaffarpur, Darbhanga and North Monghyr where plague is endemic. The disease appears almost every year in these places with the approach of the winter season, reaches its maximum intensity during February and March and declines with the advent of the summer months. The usual measures of rat destruction, inoculation and evacuation, followed by disinfection of the infected houses, are carried out where

considered necessary. The Orissa and Chota Nagpur divisions are practically free from plague.

The mortality from fevers in the province as recorded by the Public Health Department was 564,666 in 1932; 574,548 in 1933 and 670,389 in 1934 against 729,315 in 1931. The cases treated for malaria in hospitals and dispensaries numbered 1,057,842, 882,463, 1,016,176 and 1,235,421, respectively. The figures for both general mortality from fevers and the cases treated at hospitals and dispensaries for malaria show a marked decrease during the period under review as compared with those of the year 1931 although these figures are still very high. The term fever embraces a large number of diseases in which fever has been a prominent symptom and the whole number of deaths stated above cannot be ascribed to malaria alone although malaria may account for the bulk of these deaths either directly or indirectly by lowering the vitality of its victims and thus rendering them an easy prey to other fatal diseases.

Malaria is more or less prevalent in all the districts in the province but from the annual statistics of attendance of cases at hospitals and dispensaries it is apparent that it is far more prevalent in the districts of Balasore in the Orissa division and of Purnea, Champaran, Muzaffarpur and Darbhanga in North Bihar than in other districts. In Purnea and Darbhanga alone the cases treated for malaria numbered 129,329 and 125,045, respectively, in 1934. In addition to quinine and cinchona powder which have been usually used for the treatment of malaria the two drugs atebrin and plasmochin are being used extensively in towns and good results obtained.

At the close of the last triennium there were six leper asylums, two leper colonies and thirty-six leper clinics in the province. The triennium under review closed with the same number of leper asylums and colonies but the number of clinics rose to fifty during this period. The asylum at Deoghar and the colony at Puri are maintained by public bodies, while others are maintained by missions aided by private donations and subscriptions and by grants from Government and local bodies. Of the clinics, three are maintained by Government and three by the Bettiah Raj and the rest are maintained by local bodies with the grants-in-aid from the Bihar and Orissa Leprosy Relief Committee.

The accommodation at the leper asylums and colonies increased from 2,074 in 1931 to 2,105 in 1934. The number of resident lepers in these institutions was 1,999 in 1932, 1,909 in 1933 and 2,198 in 1934 and of those who came from outside for treatment, was 2,514, 3,103 and 2,093, respectively. The Provincial Committee of the British Empire Leprosy Relief Association as well as the local Government have done their best to promote the anti-leprosy campaign in this province but owing to financial stringency Government were compelled to abolish the post of the leprosy expert and the survey party in 1932 and since then it has not been found possible to revive the leprosy expert's post, although appointment of such an officer is highly desirable.

Leprosy is so common that it seems as if we shall have to rely on the ordinary dispensary to treat it and this can only be done by seeing that the training in this disease is adequate in our medical colleges and schools.

Treatment in ordinary dispensaries presents little difficulty, if any, with the co-operation of the doctors and any objection on the score of infectivity may be allayed by calling the lepers for treatment in the afternoon and treating them in a small hut or building in the dispensary compound. Such leprosy treatment should be done as part of the ordinary dispensary routine and involve no extra allowance to any doctor or compounder.

The number of cases of tuberculosis treated in hospitals and dispensaries for the tubercle of the lung was 17,812 in 1932, 18,721 in 1933 and 18,383 in 1934 as compared with an average of 18,106 a year during the previous triennium. This number is very small in comparison with the large number of cases suffering from this disease, who never get the opportunity of

attending hospitals and dispensaries at all and in the end succumb to the disease.

The tuberculosis problem has become very important and demands the earnest attention of Government. Until now little has been done in the province to tackle the problem of tuberculosis. It is essentially an economic disease, dependent on the adequate feeding of the population and on hygiene. It may be possible to improve the latter by education and efforts will shortly be made to open outdoor tuberculosis clinics where cases can be examined and treated, given advice and by the employment of visitors, to educate sufferers and their relations in avoidance of dissemination of infection by precautions in the home.

During the triennial period under report 704 cases of beri-beri were treated in all hospitals and dispensaries in 1932; 387 cases in 1933 and 1,834 cases in 1934. This disease occurred more or less in all the districts in the province with the exception of a few only. In the Manbhum district, however, a large number of cases, viz, 1,393, attended the dispensaries in 1934 and this disease took an epidemic form in this district after the close of the year. Both Government and the local bodies took necessary steps to combat the disease which subsided after some months. With the exception of the outbreak in Manbhum we have not been visited with severe epidemics such as occur in Bengal*.

The patients treated for ankylostomiasis numbered 19,439 in 1932; 18,000 in 1933 and 21,966 in 1934 or a total of 59,405 as compared with 61,762 in the preceding triennium. Hookworm infection is no doubt a great menace to the general health of the province and is really responsible for much ill health amongst the people in general. Except in the case of the police and the jail inmates, who are under the official control, much cannot be done unless and until the people are sufficiently educated to realize the evil effect of this disease and take steps necessary to safeguard themselves from its attack.

There has been very little change in the attitude of the public towards the support of the medical institutions. Their attitude, as manifested by their subscriptions, is one of entire lack of interest. Although the promised support in the shape of monthly subscriptions is often generous the managing committees find great difficulty in realizing those subscriptions. In most cases they become heavily in arrears and have at last to be written off. Even the members of the managing committees are often found by the inspecting officers to be very irregular in paying their own subscriptions. Unless they show examples of regularity in this respect they cannot expect others to be regular in payment of their subscriptions. If all well-to-do people in rural areas come forward and pay some monthly subscriptions regularly to the hospitals and dispensaries in their localities, much improvement could be effected in those medical institutions.

It was experienced in the previous triennium that the allopathic hospitals and dispensaries were rapidly gaining in popularity but the financial difficulties created by the economic depression made it impossible during the present triennium for Government as well as the local bodies either to increase their expenditure or even to maintain their existing limit of expenditure on medical relief. The managing committees which were expected to supplement the income from subscriptions raised locally failed to do so. The local bodies and the managing committees were, therefore, authorized to charge a fee of not more than one anna for each prescription from all except the really indigent patients. Some dispensaries have availed themselves of this means of increasing their income and it is hoped that this arrangement will

*The disease to which we believe the writer is referring is epidemic dropsy and not beri-beri. Beri-beri is a disease caused by deficiencies of vitamin B in the diet and there is no evidence at all that this deficiency plays any part in the aetiology of epidemic dropsy.—*EDITOR, I. M. G.*

serve to relieve to some extent the financial position of those institutions and also have educative value. Up to date it has not been found possible to realize more than a very small amount by this method. The Indian public has unfortunately grown accustomed to the idea that the maintenance of hospitals and dispensaries and the medical relief are the duties of Government and there is consequently very little enthusiasm to contribute anything for their assistance.

Prince of Wales' Medical College, Patna.—A decade has passed since this college opened in 1925. At every stage of its evolution, it has been inspected by eminent medical men regarding its teachers, teaching methods and equipment. In 1927, Sir Norman Walker and Sir Richard Needham made a thorough inspection of this institution. Most of their recommendations were acted upon. Again in 1929 General Sprawson inspected the final M.B., B.S. examination and made a satisfactory report on the standard of the examinations. Recently the Inspectors of the Indian Medical Council have made a thorough inspection of the courses of study of the teaching methods, theoretical, clinical and practical, in every subject and of the final M.B., B.S. examination. Their constructive suggestions, if given effect to, will considerably enhance the efficiency of the institution the function of which is to supply well-trained medical practitioners for the province. As a result of the last inspection the college has been recognized and has now been included in schedule I of the Indian Medical Act of 1933.

The terrible earthquake of January 1934 caused the residential building of the Principal of the college to collapse and damaged the college buildings considerably. Practically all classes had to be suspended for some days to ascertain the extent of the damage done and to effect urgent repairs. The University examinations due in March were deferred by about a month to make up for the classes lost and the annual vacation was changed to commence from the 16th April to 15th July. The students and the staff of the college took an active part in the relief work started in connection with the disaster caused by the earthquake both locally and outside. The damaged buildings have all been repaired.

The Radium Institute, which was, since its transfer from Ranchi to Patna, located in a portion of the building of the hospital for women attached to the Patna Medical College Hospital, was moved to the new building, provided by the generosity of K.umar Visheshwar Singh of Darbhanga in the compound of the Medical College and Hospital on its completion and opening by His Excellency the Governor of Bihar and Orissa at the end of March 1932. In this building accommodation has been provided for eighteen patients (12 males and 6 females) in addition to a set of cabins for ordinary patients under treatment by radium. An operation theatre has been provided in it and also sufficient accommodation for daily work. There is also a separate set of family quarters with all the modern comforts and conveniences for the accommodation of better class of Indian paying patients and in addition the Wheeler ward of the Patna Medical College Hospital provides sufficient suitable accommodation for European patients. The institute has now completed the thirteenth year of its existence, the last seven years being in Patna. This is the only institute of its kind in India and is becoming more and more popular every day. The number of patients treated at the institute has steadily increased from 654 in 1931 to 721 in 1932, 838 in 1933 and 804 in 1934. The slight decrease in 1934 was mainly due to the earthquake in the early part of the year which prevented many patients from coming to Patna from outside owing to wild rumours of the wholesale destruction that were prevalent at that time. Of the cases treated, as stated above, 130 became clinically free from all signs and symptoms of the disease, 47 were cured and 252 improved in 1932. The corresponding figures for 1933 were 170, 54 and 292 and for 1934 were 109, 26 and 293, respectively. The number of deaths amongst these patients was 13 in 1932, 18 in 1933 and 25 in 1934. The gradual increase in

mortality is due to more advanced cases being sent up now for treatment at Patna and early cases being treated locally in some parts of India where smaller quantities of radium are now available.

The Itki Sanatorium which was established by Government for the treatment of pulmonary tuberculosis has completed the sixth year of its existence and has been working very satisfactorily under its Superintendent, Dr. D. V. Gnanamuthu. Only patients who are residents of the province are admitted in this institution. At present it has got accommodation in all for 66 patients including that in the female blocks constructed in 1934, viz, four Europeans or Indians living in European style, 48 male Indians and 14 female Indians. This accommodation is not sufficient to cope with the present demand resulting from the increasing popularity of the institution. In order to provide this sanatorium with more accommodation a scheme has been worked out and approved by Government. Under this scheme the district boards and municipalities in the province have been invited to make contributions, if they so desire, to build some wards in the sanatorium compound on condition that the wards thus constructed will be named after the district boards and municipalities concerned and that persons residing within the jurisdiction of such district boards and municipalities should always have the first claim to accommodation in these wards. The new wards will be constructed by Government from the money contributed by the local bodies. The sanatorium, as a whole, will continue to be purely a Government institution and Government will be wholly responsible for the maintenance of the new buildings after they have been constructed. The whole of the additional recurring and non-recurring expenditure and other expenditure incidental to the enlargement of the sanatorium will be borne by Government. A large portion of the recurring cost would in fact be covered by the fees realized from the patients but anything that was not so covered will be a net charge on the provincial revenues and the local bodies will not be called on to meet any portion of this cost after they have made their initial contribution towards the actual construction of the buildings. In response to this call, some local bodies have already expressed their willingness to contribute their quota and the scheme for the construction of 31 wards has already been taken in hand and it is hoped that it will be possible in the near future partially to meet the additional demand for accommodation at the sanatorium.

As usual, the training of *dais* continued during the period under review at several hospitals and maternity and child welfare centres according to the syllabus of the Central Victoria Memorial Scholarships Fund. Most of those who came forward for training belonged to the indigenous class of *dais*. As a large number of *dais* under training leave the class before completing the full period of the course, they cannot appear at the examination and it is for this reason that the number of successful *dais* is much less than it should have been.

The Bihar and Orissa Legislative Council have recently passed the Nurses Registration Act, 1935, under which nurses, health visitors, midwives and trained *dais* may get their names registered in the registers to be maintained for the purpose by the Registrar of the Bihar and Orissa Nurses Registration Council. It has been provided in the above-mentioned Act that a local authority may make by-laws prohibiting unregistered persons from practising as nurses, health visitors, midwives, trained *dais* or *dais* within the area subject to its authority and may in such by-laws provide that any person practising in contravention of such by-laws or any person committing or abetting the commitment of a breach of any such by-laws shall be punishable with fine not exceeding rupees two hundred and fifty. It has also been provided in the Act that if any local authority fails to make by-laws referred to above the local Government may by notification prohibit unregistered persons from practising as nurses, etc., within the area subject to

that local authority. It is hoped that this will now bring about the object long wished for.

The Bihar and Orissa Maternity and Child Welfare Society which was established in 1928 in order to organize and control the maternity and child welfare work in the province completed the seventh year of its existence at the end of the triennial period under review and continued its useful career throughout the period through its various centres in the province.

REPORT OF THE CHEMICAL EXAMINER TO THE GOVERNMENT OF MADRAS FOR THE YEAR 1935

HUMAN POISONING CASES

THE total number of human poisoning cases investigated during the year was 380 with 2,349 articles, as against 327 cases with 1,995 articles during the previous year. Poison was detected in 198 cases or 52.1 per cent as against 53.2 per cent in 1934.

Oleander heads the list again this year with 38 cases. Opium or its alkaloids come next with 27 cases closely followed by datura or mydriatic alkaloids with 20 cases. There were 16 arsenic cases, 16 mercury cases, and 10 aconite cases. Amongst the less common poisons we had copper salts in 11 cases, madar juice in 5 cases, and ganja (*Cannabis indica*) in 4 cases. In 16 cases the nature of the organic poison could not be determined.

The following cases are selected as of interest:—

Mercury.—A man suffering from venereal disease was given a drug by someone as a remedy. The man took the medicine and died the next morning. Mercury in soluble form equivalent to about 2-7/10 grains of corrosive sublimate was detected in the viscera.

Arsenic.—Two men played a dangerous practical joke on a third man. One of the two offered the third man some betel leaves and areca nuts to chew. Soon after chewing the mixture the victim felt burning pain in the mouth, throat and chest, drank 'potfuls' of water, and behaved like a lunatic for a time throwing stones at passers-by, cattle and other objects. After the symptoms subsided he suffered from loss of speech for some time but was quite well in a week. A portion of the material chewed by the victim was sent and we found in it arsenic in soluble form equivalent to about four-fifths of a grain of white arsenic.

A servant in a house was seen putting his hand into a vessel in which salt was stored. Some time later food was prepared with this salt and partaken of by the four members of the family. When they started eating they found the food to be 'tasteless', and so all of them stopped eating. All four of them suffered from pain in the abdomen and vomiting, but recovered after treatment in hospital. We found about 2-3/5 grains of white arsenic in the remnants of the food, about 7 grains of white arsenic in the remaining portion of salt, and minute quantities of arsenic in each of the two vomits received.

Copper sulphate.—During recent years there has been an increase in the use of copper sulphate as a poison.

The dead body of a man was found in the fields with a small amount of bluish green vomit by his side. The viscera and the vomit as well as some blue particles found in the pocket of the deceased were sent to us. We found copper in the stomach and intestines, equivalent to about 95 grains of crystalline copper sulphate, and in the vomit equivalent to about 51 grains of crystalline copper sulphate. We detected minute quantities of copper in the liver and kidneys. The particles from the pocket were found to be crystalline copper sulphate.

In another case we found copper equivalent to about 98 grains of crystalline copper sulphate in the stomach and contents, equivalent to about 4-1/10 grains of crystalline copper sulphate in the small intestines and contents, equivalent to about 3½ grains of crystalline copper sulphate in 1 lb. of liver, and equivalent to

about ¼ of a grain of crystalline copper sulphate in one kidney.

In a third case, the victim (a woman) was removed to hospital, and the stomach was washed out. She lived for four days and died with jaundice and albuminuria. We found only minute quantities of copper in the viscera, but copper equivalent to about 33 grains of crystalline copper sulphate in the vomit and stomach washings.

Oleander.—A man stabbed his wife with a knife. He was caught red-handed and produced before the village magistrate. While being questioned in the street by the village magistrate, he suddenly vomited, collapsed and died. We obtained the reactions of oleander from the viscera. Some suspected material seized from the house of the deceased showed the presence of the kernels and shells of yellow oleander.

In another case a woman aged 40, suffering from a painful and incurable disease, implored her mother to give her something to end her misery. The mother obtained some bark and roots of oleander (*Nerium odorum*). She made these into a paste and gave it to her daughter who died after swallowing the paste. We obtained the reactions of oleander from the viscera, from the incrustations in the shell in which the paste had been kept, from the stone used for grinding the paste, and from the pieces of bark used in the preparation of the paste.

Cannabis indica (ganja).—A man, who had been suffering from pain in the stomach, ate some medicinal preparation for the relief of the pain and went to bed. He got up next morning and in a semiconscious state went to an adjoining channel for his morning ablutions. He slipped and fell into the water and was drowned. His viscera were sent to us and also a portion of the medicine. We found particles of ganja, but not any other poison, in his stomach, and we found the medicine to be a preparation of ganja.

In another case a child aged 11 months who had been suffering from dysentery was given some 'majunum' (ganja paste). As the child became worse it was admitted into hospital where it died. The 'majunum' and the viscera were sent to us. We detected ganja in the 'majunum' but not in the stomach contents. Opium was specially looked for but was not detected in either.

In another case four persons were given some 'legyam' by a quack doctor. They showed the following symptoms: Burning sensation and twitching of tongue, incoherent speech, unsteady gait, giddiness with an inclination to sleep and a sensation of imminent death. Their stomachs were washed out in hospital and they recovered. Their stomach washes were sent to us and also the 'legyam'. We detected particles of ganja in the 'legyam' but only in one of the stomach washes.

Madar.—There were five cases of madar poisoning. All were suicidal. Details of the quantity of the juice swallowed or the symptoms observed were not available, except in one case where purging was the only symptom noted. The post-mortem signs in each of the cases were those of decomposition. We obtained from the viscera in each of the five cases the reactions of madar juice.

Glass powder, etc.—A man was stated to have swallowed nitric acid, powdered glass and kerosene oil. He probably intended to make trebly sure of ending his life, but was removed to hospital where he recovered. We detected in the vomit nitrates, kerosene oil and particles of glass.

There is a popular belief not only in India that diamond powder is highly poisonous.

A man swallowed eight powdered diamonds to commit suicide. The size of the diamonds is not known. An hour later he complained of pain in the stomach and was attended to by a doctor. His temperature was normal, pulse steady, 120 per minute, and respirations 30. His stomach was washed out and he was given boiled rice and butter to swallow. He recovered. The stomach wash was sent to us and we

detected in it minute transparent particles visible under the microscope.

In another case it was rumoured that a woman had been killed by administration of a poison. We did not receive the viscera, but only the suspected poison. It was a fine powder, soft to the touch, consisting of minute glistening particles. We found the powder to be powdered mica, a harmless substance in such a fine state of division.

Potassium nitrite.—A boy aged 15 years was found in convulsions and in an unconscious state at a railway station. In his clothes was found a packet containing a white powder. He was removed to hospital and died five minutes after admission. The medical officer at the time of admission noted that the finger tips were blue. After post-mortem examination, the viscera and the suspected powder were sent here for analysis. We found the powder to be potassium nitrite weighing about 463 grains. We extracted from the stomach and contents nitrite equivalent to about 86 grains of potassium nitrite. In the sample of urine, one ounce of which had been preserved by the addition of 3 ounces of spirit, we found nitrite equivalent to about 85 parts of potassium nitrite per million, corresponding to about 340 parts of potassium nitrite per million in the undiluted urine. This urine showed almost complete absence of urea when tested with potassium hypobromite.

ANNUAL REPORT OF THE PUBLIC HEALTH DEPARTMENT, TRAVANCORE, 1935

DR. W. C. SWEET, Representative of the Rockefeller Foundation, was appointed Honorary Adviser to Government in public health matters in succession to Dr. W. P. Jacobs, who left Travancore in January 1935.

There was an addition of 63,009 to the population of the state during the year, against 47,676 in the previous year. The number of deaths from all causes was 57,206. The birth rate was 22.0 per mille of population against 20.26 in the previous year and the death rate fell from 11.39 to 10.5. The rate of infantile mortality was 83.86 against 95.56.

The recorded birth rate for the municipalities, conservancy towns and rural areas was 34.43, 39.94 and 22.08 respectively and the recorded death rate was 16.06, 19.56 and 10.51. It is clear that the existing system of collection of vital statistics is far from satisfactory. The true state of public health can be gauged only from correct vital statistics. In reviewing the report of the department the year before, the Government called for a scheme for the better registration of vital statistics. The Director of Public Health will submit without further delay the scheme for the efficient registration of vital statistics.

There was no case of plague in the state during the year. Smallpox, malaria and cholera prevailed in epidemic form. There were 2,806 attacks and 1,074 deaths from smallpox. This shows the need for more extensive vaccination. The intensive vaccination campaign now in progress should be carried on with greater expedition so as to afford the whole population in the state protection against smallpox. The number of vaccinations performed in all the municipalities was 86,270 against 202,453 the year before. Only about twelve per cent of the children within the Shencottah municipality have so far been vaccinated.

There was a severe outbreak of malaria in epidemic form in the taluks of Vilavancode, Neyyattinkara, Nedumangad and Thodupuzha. Temporary hospitals were established in the areas which were severely affected and arrangements were also made for the wide distribution of quinine among the affected population. The disease was prevailing in many parts of the state at the close of the year.

There were 615 attacks and 271 deaths from cholera. South Travancore and Shencottah taluk were the localities chiefly affected by this epidemic.

On the reversion of Mr. M. O. T. Iyengar, Medical Entomologist, to British Indian Service at the expiry of his period of service the Medical Entomology Section of the department was reorganized. The laboratory work was placed under the supervision of the Superintendent, Public Health Laboratory. For purposes of field work, the state was divided into two circles, Northern and Southern, and an assistant surgeon was put in charge of each circle. The filariasis control measures in Shertallai taluk were continued. The mosquito control operations within the Trivandrum municipality were taken over by the Municipal Council and Government contributed a sum of Rs. 3,882 for the purpose. Mosquito control measures were started within the Alleppey municipality on the half contribution system.

The Public Health Laboratory continued its usual work of bacteriological and pathological service. Improvements were effected in the manufacture of smallpox vaccine and a larger number of auto-vaccines were prepared in the year than in the previous years. It is gratifying to note that the laboratory was able to meet the entire requirements of the Public Health Department for cholera and smallpox vaccines.

ANNUAL REPORT ON THE BERRY-WHITE MEDICAL SCHOOL, DIBRUGARH, FOR THE YEAR 1935-36

Number of students.—On the 1st April, 1935, there were 181 medical students on the rolls remaining from the previous year. Fifty-six new students were admitted to the first year class at the beginning of the session in July 1935 and 11 former students were readmitted during the year. Of these, 36 students passed out as L.M.P., 16 were removed for failure at the examination, 8 left school for reasons not known and 1 was rusticated for 6 months for misconduct. The year closed with 187 students on the rolls.

School session.—The school session begins on the 1st July and closes on 30th June every year, but the report deals with the working of the school for the period from 1st April to 31st March.

Hostel accommodation.—The police hospital was converted into a students' hostel at the beginning of the session. This had given the much-needed extra accommodation to house the medical students and the pupil compounders.

Library.—New books and periodicals were purchased during the year to the extent of Rs. 999 against Rs. 1,062 in the previous year.

X-rays.—This school is now equipped with a modern x-ray plant and can undertake all kinds of radiological work. Whenever possible the radiograms were demonstrated to the students. A diathermy apparatus has been purchased during the year. With it diathermy surgery and diathermy treatment have been shown to the students. This instrument will remove a long-felt want in diathermy surgery and treatment.

There was an income of Rs. 1,361 from the x-ray department during the year against Rs. 883 in the previous year. A revision of the scales of fees for x-ray treatment is now under the consideration of Government and it is expected that a larger number of cases will be available after their introduction.

Final examination.—Sixty-four students appeared at this examination during the year, and 36 passed, i.e., 17 at the first attempt and 19 on re-examination.

The percentage of passes was 56 against 47 in the previous year.

Primary examination.—Seventy-two students were allowed to appear at the primary or first licence examinations of the Board held in April and October 1935; 43 passed, i.e., 21 at the first attempt and 22 on re-examination.

The percentage of passes was 59 against 70 in the previous year.

Correspondence

INTESTINAL TUBERCULOSIS AND AURO-THERAPY

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—In my reply to Dr. Roy Chowdhry of Delhi which was published in the July number of the *Gazette*, I referred him to an interesting discussion that took place in London in a meeting of the Tuberculosis Association on the subject of intestinal tuberculosis. I have given expression to my views on some of the points discussed in the meeting. These views have appeared in *Tubercle* (August 1936). I shall be glad if they can also appear in your journal as they may be of interest to those who, like Dr. Roy Chowdhry, have taken the trouble to read my article on intestinal tuberculosis, published in the February number of the *Gazette*.

Dr. Maxwell has attempted to classify the intestinal lesions into different types which, to a clinician, would appear to be what I should like to describe as a 'pathological nicety'. From the clinician's point of view, it should be sufficient to classify intestinal tuberculosis into two varieties: namely, (i) primary or hyperplastic; and (ii) secondary or ulcerative, the latter being a very common complication of the disease in the lungs.

Dr. Maxwell has advocated the use of gold in the treatment of intestinal tuberculosis. Dr. Heaf appears to be surprised at Dr. Maxwell's suggestion and believes that gold is contra-indicated. The question is a debatable one. It appears to me that the results of gold treatment depend upon the type of intestinal tuberculosis that is being treated.

Like the kidneys, the intestine is an important organ through which a large proportion of gold is excreted, and gold being a heavy metal is liable to exert its toxic effects on these organs.

Secondary tuberculosis of the intestine is a manifestation of Koch's phenomenon and is, therefore, frankly ulcerative, and I am not sure if gold will do any good in this type. There is not much reactive fibrosis in the ulcerative type and one of the important functions of gold treatment is to stimulate the formation of fibrous tissue in the diseased parts. When, therefore, ulceration is present in the intestinal walls with consequent mucous discharge gold is not likely to do any good. It may even irritate the mucous membrane and make the condition worse.

It is possible that the gold results obtained by Dr. Maxwell were due to the fact that the cases treated by him were 'toxæmic' in nature, as pointed out by Dr. Burrell, and were not cases of tuberculous ulceration of the intestine.

On the other hand, gold is well worth trying in the primary type of intestinal tuberculosis and may give satisfactory results owing to the stimulation of fibrous tissue in the diseased parts.

In India, where infection by the bovine tubercle bacillus is non-existent for all practical purposes, intestinal tuberculosis occurs in a large number of cases suffering from tuberculosis of the lungs. Racial immunity in this country has not yet developed to any appreciable extent and therefore, owing to the lack of innate resistance on the part of patients, the disease spreads sooner or later to the intestines from the lungs. One of the reasons why we do not get such good results from gold treatment in pulmonary tuberculosis in this country as, we read, are obtained in the Western countries is perhaps the fact that the intestinal complication is associated in some degree with the disease in the lungs.

Yours, etc.,

Y. G. SHRIKHANDE, B.Sc.,
M.B., B.S., T.D.D. (Wales).

KING EDWARD VII SANATORIUM,
BHOWALI, U. P.

ANTISEPTIC PROPERTIES OF RAW COD-LIVER OIL

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—Regarding my correspondence in your esteemed journal of the month of June on the subject of my experiences about 'the antiseptic and healing powers of cod-liver oil', I have been getting queries from medical men who are anxious to take up the enquiry in right earnest. In reply, I would like to give the following hints:—

- (1) It must be raw.
- (2) Boiling spoils its antiseptic and healing powers.
- (3) The tissues must be bathed in it and must be in direct touch with the oil before healing can take place effectively.
- (4) This can best be helped by taking off all unhealthy layers from the wound surface.
- (5) For example, a mammary abscess or a sinus may have a pocket within a pocket or a sub-pocket in the one case and an intervening channel in the other cases which may prevent the oil from attacking the septic focus and thus the result may be unsatisfactory. Washing out with any lotion or hydrogen peroxide will not interfere with the healing powers of the oil. It kills all germs and certainly inhibits all growth. I have done many cases and have had more satisfactory results than with acriflavine, eusol or chlorogen.

A little space in your esteemed journal will highly oblige me and will satisfy the curiosity of many in the profession.

Yours, etc.,

C. C. BOSE, B.A., L.R.C.P., L.R.C.S. (Edin.),
L.R.F.P. & S. (Glas.), L.M. (Dub.),
Late State Surgeon, Dacca.

86, GIRISH CH. BOSE ROAD,

LUCKNOW,

4th September, 1936.

[Heating cod-liver oil up to 100°C. in a narrow-necked flask will not seriously affect its vitamin-A or vitamin-D content. We do not, however, yet know wherein lie the healing qualities of cod-liver oil.—
EDITOR, I. M. G.]

Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL R. H. CANDY, Civil Surgeon and Superintendent, B. J. Medical School, Poona, is appointed to officiate as Surgeon-General with the Government of Bombay, with effect from the date he assumes charge, *vice* Major-General E. W. C. Bradfield, C.I.E., O.B.E., K.H.S., granted leave.

Major A. C. Chatterji is appointed substantively to the post of Director of Public Health, Bengal, with effect from the 17th June, 1936.

The services of Major E. T. N. Taylor are placed temporarily at the disposal of the Government of Assam, with effect from the afternoon of the 29th June, 1936.

In supersession of previous notification Captain A. W. West is appointed, on probation for 1 year, as Deputy Public Health Commissioner with the Government of India, with effect from the 22nd June, 1936.

Captain E. H. Lossing made over charge of the Burdwan Jail to Lieutenant-Colonel B. H. Singh on the forenoon of the 28th August, 1936.

LEAVE

Major-General E. W. C. Bradfield, C.I.E., O.B.E., K.H.S., Surgeon-General with the Government of Bombay, is granted leave for 3 months and 2 days, with effect from the 27th July, 1936, and with permission to prefix Sunday, the 26th July, 1936, to the leave.

Lieutenant-Colonel G. G. Jolly, C.I.E., V.H.S., Officiating Public Health Commissioner with the Government of India, is granted leave for 5 months and 14 days, with effect from the 8th August, 1936, or date of availing. His services are replaced at the disposal of

the Government of Burma, with effect from the date of expiry of the leave.

Lieutenant-Colonel S. Nag, Civil Surgeon, Mymensingh, is granted leave for 21 days, with effect from the 27th September, 1936.

PROMOTIONS

Brevet-Colonels to be Colonels

A. J. H. Russell, C.B.E., K.H.S. (Supernumerary). Dated 29th January, 1936, with seniority 27th January, 1931.

H. H. Thorburn, C.I.E. Dated 4th March, 1936, with seniority 1st March, 1930.

Lieutenant-Colonel to be Colonel

J. Taylor, D.S.O., V.H.S. (Supernumerary). Dated 4th March, 1936, with seniority 1st March, 1930.

Captain to be Major

D. N. Chakravarti. Dated 10th June, 1936.

RETIREMENTS

Lieutenant-Colonel G. W. Maconachie. Dated 5th July, 1936.

Lieutenant-Colonel J. R. D. Webb, O.B.E. Dated 15th July, 1936.

Notes

A USEFUL CATALOGUE

MALGHAM BROS. of Bombay have just issued a very comprehensive catalogue of surgical instruments, and theatre and hospital equipment. The catalogue consists of about fifteen hundred different items, each one of which appears to be depicted. The list includes all instruments used at special operations on the eye, nose, ear, throat, urethra, rectum, etc., electrical apparatus, electrocautery, electrocardiograph, and various equipments for light and heat treatment, and for lighting the operating theatre; they make a special feature of the last-named and show a variety of non-shadow lamps. There is a good index.

A great deal of trouble has been expended to make this catalogue complete and up to date. Malgham Bros., 26, Old Custom House Road, Bombay, are prepared to send copies of this list, as long as the supply lasts, to members of the medical and dental professions and to institutions.

DETTOL IN AURAL MYIASIS

NASAL and aural myiasis are both common in this country, so that the following case reported recently in the *British Medical Journal* is of interest:

'A farm hand, aged 30, attended surgery on the morning of 25th July, complaining of acute pain in, and a blood-stained discharge from, the left ear. He stated that while tending horses in the afternoon of 23rd July a fly had entered his left ear, "buzzed about a minute or two" and flew out. During the afternoon of 24th July irritation was felt in the ear. As the day went on this irritation gradually became acutely painful, and prevented sleep during the night of 24th to 25th July. The pain was described as a "burning in the ear". There were blood stains on the pillow in the morning.

On examination no tenderness was elicited over the mastoid nor in front of the ear. The ear was not protruding abnormally. The external auditory meatus was occluded by serosanguineous discharge, in which two small white maggots were seen wriggling. The ear was gently syringed with warm water, two maggots being removed. Auroscopic examination now revealed a mass of maggots completely obstructing the meatal canal. Gentle syringing, using a weak solution of dettol (2 drachms to 1 pint of water) which caused the maggots to wriggle vigorously and disimpact themselves, easily removed them. When all were removed the

meatal walls and the tympanum were seen to be congested and œdematous. The landmarks of the tympanum were quite obliterated by the swelling, but there did not appear to be any perforation.

THIARSIN

A NEW ANTISYPHILITIC DRUG

THIS is a stable complex organic compound of arsenic—Dioxy-diamino-arseno-benzol N : N'-Methylene sodium sulphite—prepared by the Research Department of the Bengal Chemical and Pharmaceutical Works, Limited, Calcutta. Extensive clinical trial in hospitals and investigation in laboratories have proved it to be an efficient spirillicide. It contains approximately 20 per cent of arsenic and is equivalent to sulpharsphenamine B. P. and is only one-fifth as toxic as arsphenamine and one-fourth as toxic as neoarsphenamine.

Each batch of Thiarsin is carefully tested chemically and biologically before being offered for sale.

Thiarsin is a light-yellow powder readily soluble in water. Dissolved in distilled water it forms a clear solution varying in colour from yellow to orange according to concentration.

Thiarsin is chiefly used intramuscularly. It can also be safely administered by the subcutaneous, and intravenous routes. It is primarily indicated in all stages of syphilis and also efficacious in many other diseases, e.g., severe cases of malaria (in conjunction with quinine), spirillosis, frambœsia (yaws), and relapsing fever.

It is sold in the following packings:—0.075 gramme, 0.15 gramme, 0.30 gramme, 0.45 gramme, 0.60 gramme.

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Original Articles

FACIAL CELLULITIS

(A STUDY OF 55 CASES; FROM FEBRUARY 1932 TO AUGUST 1936)

By P. CHATTERJI, M.B. (Cal.), F.R.C.S. (Edin.)
Honorary Additional Visiting Surgeon, Medical College
Hospital, Calcutta

and

M. N. DE, M.B. (Cal.), M.R.C.P. (Lond.)
Professor of Pathology, Medical College, Calcutta

THIS paper is a critical study of 55 cases of rapidly-spreading cellulitis arising in the facial region. The acuteness of the malady, the rapidity of its spread, the involvement of the vital structures, and the appalling mortality rate justify an investigation into its ætiology, bacterial flora, morbid anatomy, clinical course, and the results of treatment.

Age incidence.—The disease may affect persons of all ages. The fulminant types are, however, more commonly met with in healthy young people in the third and fourth decades of life. In the cases under investigation, the age incidence of the patients is as follows :—

1st decade	..	..	4
2nd decade	..	..	7
3rd decade	..	..	24
4th decade	..	..	13
5th decade	..	..	6
6th decade	..	..	1
TOTAL			55

The youngest patient was a female child of 2 years and the oldest a man of 60 years.

Seasonal incidence.—It is often believed that there is a definite seasonal variation in the incidence of this condition and the cases are more frequently found in the hot summer and sticky humid monsoon months. It is no doubt correct to say that cases of pyogenic infection of the skin are met with in abundance from May to September when constant perspiration keeps the skin surface always moist. Unless kept scrupulously clean, this generally allows dirt and infected matter to stick to the surface and block the ducts of the sweat and sebaceous glands which thus infected produce crops of furuncles. Moreover, the atmosphere being saturated with aqueous vapour prevents a rapid evaporation of sweat from the skin. The result is that the skin epithelium gets sodden and is unable to exert its natural protective influence. It has been definitely observed (Arnold and others, 1930; Colebrook, 1930) that many pyogenic organisms are rapidly killed and eliminated from the surface of the normal

healthy skin, possibly on account of its auto-sterilizing power. Such a protective power being very much diminished in the sticky monsoon weather, pyogenic bacteria tend to persist longer and thus obtain a better chance to infect the skin and its appendages.

From a study of our series of cases, however, it will be noticed that seasonal variations exert very little influence on the incidence of facial cellulitis. The following table has been compiled from our cases :—

January	..	5	July	..	6
February	..	4	August	..	5
March	..	4	September	..	4
April	..	6	October	..	3
May	..	3	November	..	2
June	..	4	December	..	8

Date not recorded 1

Anatomical considerations.—In order to understand the morbid anatomy of the disease and the line of spread of the infection, it is necessary to note certain peculiarities regarding the anatomical structures of the part. The skin of the face is very rich in sebaceous and sweat glands and these make it admirably suited for the development of acne. The nature and disposition of the connective tissues and the arrangement and insertion of the facial muscles are somewhat peculiar in this area. In the face proper, the connective tissue spaces are variously intersected by most of the facial muscles which have their insertion into the integument.

For instance, the whole thickness of the lip between the skin and the mucous membrane consists of the fibres of the orbicularis oris muscle intimately mixed with fibro-connective tissue and having their insertion into the skin. Moreover, the muscles from different parts of the face converge towards the angle of the mouth and their fibres interlace with those of the orbicularis oris muscle. It is for these reasons that inflammatory exudates in this region do not usually spread rapidly along the lip, but tend to remain localized causing a tense and painful swelling which exerts undue pressure on the rich plexus of blood vessels lying in its substance, and leads to retardation of blood flow and even to thrombosis. Besides, every movement of the lip and the adjoining portions of the face will cause a contraction of the muscle fibres. The part will thus never get the rest which is so essential for the control, localization and cure of all inflammatory processes in the body.

The connective tissue of the cheek has no supporting fascia. The space between the skin and the buccinator muscle is occupied by loose cellular tissue and the buccinator pad of fat. Traumatic extravasations and inflammatory exudates tend to spread through this lax cellular tissue more rapidly. Moreover its deeper connections cause the infection to spread into the dangerous areas. Traced below it passes over the lower jaw to the cellular tissues of the neck and upper part of the chest. Above, it is continuous with the cellular

tissue of the upper eyelids and through the inner canthus of the eye and the bridge of the nose with the cellular tissues of the scalp.

Along the inner edge of the masseter muscle the cellular tissue of the cheek dips down to be continuous with the cellular plane of the pterygoid region. The latter has wide and important connections. Above, it is continued over the great wing of the sphenoid into the subtemporal space and along the inferior orbital tissues into the orbit. Traced downwards it follows the line of the bucco-pharyngeal fascia and becomes continuous with the retropharyngeal cellular space. The importance of the cellular tissues in the pterygoid region in inflammatory conditions is due to the fact that it surrounds the pterygoid venous plexus leading to infective thrombophlebitis. It is also intimately connected with the wall of the internal jugular vein.

In the scalp the superficial fascia is dense, thick and adherent to the skin. Infection in the superficial plane, therefore, finds it difficult to spread. It usually remains localized causing a tense painful swelling. The loose cellular plane of the scalp actually lies behind the epicranial aponeurosis between it and the pericranium. In the supra-orbital and temporal regions, however, the loose cellular tissues become denser and more closely connected with the galea aponeurotica and frontalis muscles. This anatomical peculiarity renders it difficult for an inflammatory exudate to pass easily from the scalp to the facial cellular tissue and *vice versa*, unless the infective process destroys the anatomical barrier.

The nature of the blood supply of the area and its important vascular connections have a considerable



Text-figure 1.—Diagram to show the important venous channels and their communications. (1) Facial vein. (2) Angular vein. (3) Frontal vein. (4) Superior ophthalmic vein. (5) Inferior ophthalmic vein. (6) Pterygoid venous plexus. (7) Venous twig connecting the cavernous sinus with the pterygoid plexus through the foramen ovale. (8) Cavernous sinus.

influence on the course and prognosis of this disease (text-figure 1). The main channel of vascular return of the face is the facial vein. The frontal and supra-orbital veins from the forehead converge medial to the inner canthus of the eye forming the angular vein. The

latter receives tributaries from the ala nasi and the upper eyelid and is further connected with the cavernous sinus through the superior ophthalmic vein, thus forming the first and the most important channel of communication between the veins of the forehead and face on the one hand and the cerebral sinuses on the other. The angular vein continues its course downwards and outwards as the facial vein and ultimately drains into the internal jugular vein. In the cheek, while passing under cover of the zygomatic muscle, it receives tributaries from the upper lip and the nose and freely intercommunicates with the pterygoid venous plexus through the deep facial vein. The latter plexus communicates with the cavernous sinus directly by venous trunks passing through the foramen ovale and indirectly through channels communicating with the inferior ophthalmic vein which ultimately drains into the cavernous sinus.

It will be seen from a study of the vascular connections of the facial region that an infective focus in the area of the nose or lips may extend into the cavernous sinus usually through the communications of the angular vein and less commonly through the pterygoid venous plexus. The obliquity of the angular vein, the narrow recess in which it lies, the sparse cellular tissue which forms its bed and the large number of tributaries it receives within its short course are all important factors in the pathogenesis of this malady. Another very important factor in this connection is the communication of the facial with the internal jugular vein which directly empties into the great veins of the mediastinum. This permits of a septic thrombus in the facial region to be more easily swept into the general circulation causing septicæmia and septico-pyæmia, which dominates the whole picture in a case of facial cellulitis from a very early stage.

Morbid anatomy and pathogenesis.—In the majority the infection starts in a hair follicle or a sweat gland and gives rise to the formation of a small furuncle. Its natural tendency is

EXPLANATION OF PLATE VII

- Fig. 1.—A low power photomicrograph of a section of skin of the face from a case of facial cellulitis. The small veins show thrombosis but the rest of the tissues are not affected in the inflammatory process.
- Fig. 2.—Photomicrograph of a section of skin from facial cellulitis showing a more highly magnified view of a thrombosed vein. The lumen is occupied by a thrombus with clumps of staphylococci. The latter are stained darker.
- Fig. 3.—Photomicrograph of a section of skin from a case of facial cellulitis showing a high power magnification of a thrombosed vein. The cellular infiltration is very small outside the wall of the vein. A small venous radicle is seen occupied by a thrombus.
- Fig. 4.—Photomicrograph of a section of skin from a case of facial cellulitis in the later stage. The inflammatory process has destroyed the wall of the veins and the fibro-fatty connective tissues and involved the fatty subcutaneous structures forming an acute suppurative inflammation. Such a process may ultimately localize, forming a subcutaneous abscess.
- Fig. 5.—The same picture under higher magnification showing pus formation. This is always favourable provided the condition of septicæmia is not fulminant and vital structures are not involved.



Fig. 1.

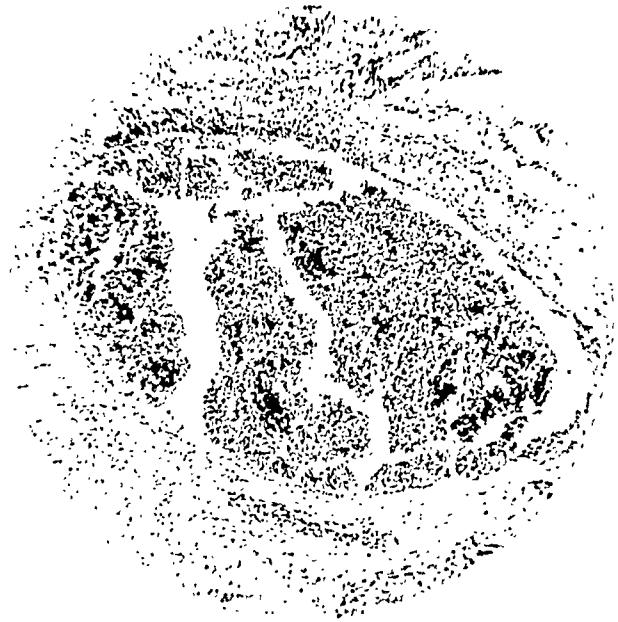


Fig. 2.

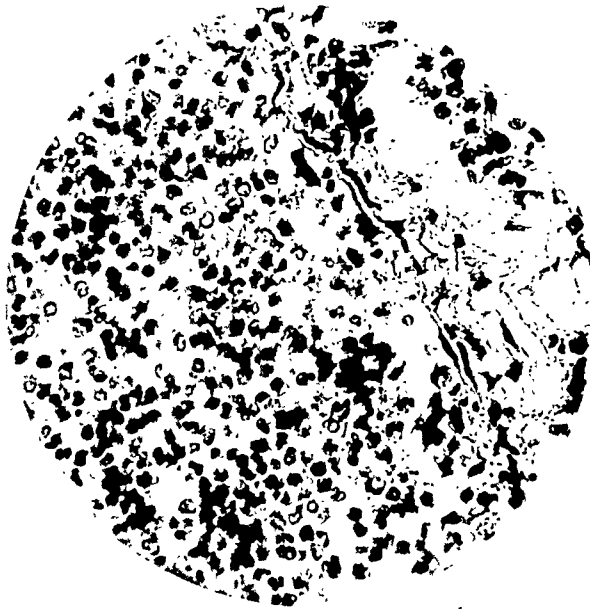


Fig. 3.



Fig. 4.

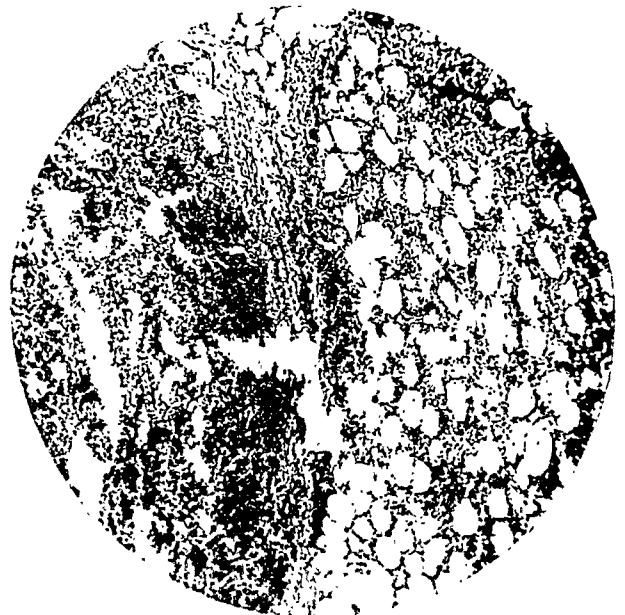


Fig. 5.

to localize and get cured. This is usually brought about by an effective mobilization of the defensive forces and the formation of a powerful leucocytic barrier around the area of infection; but if the virulence of the invading organisms is of a very high degree, as they are in facial cellulitis, the mechanism of defence is unable to cope with the situation. The phagocytes mobilized at the focus of infection are rapidly destroyed by the action of the toxins and in the absence of a resisting layer of leucocytes the organisms are able to extend into the surrounding tissues. In the majority of our cases which consisted of otherwise healthy robust young persons with apparently good general resistance, an additional factor of considerable pathological importance came into play, *viz.*, the result of local trauma in the way of squeezing, scratching or injudicious surgical interference. These, by their traumatic effects, cause 'locus resistantia minoris' due apparently to a disturbance of the zone of leucocytic infiltration and the tearing of the fasciæ and the muscular fibres which are intimately connected with the skin.

While the majority of the cases occur in individuals in perfect health, and the disease is ascribable to an abnormally high virulence of the infecting organisms aided by the effects of local trauma on the inflammatory zone, occasionally cases may be seen in persons with diminished body resistance brought about by chronic malnutrition or serious constitutional diseases, *e.g.*, diabetes, alcoholism, chronic Bright's disease, etc. In these persons, not only is there no effective mobilization of leucocytes and the formation of a powerful leucocytic barrier but the natural defensive forces of the host are very much below the normal. As a result, the organisms are able to spread rapidly into the neighbouring areas without any local trauma supervening. Whatever may be the underlying cause, once the infective organisms commence to spread to the surrounding areas, an acute inflammation with thrombophlebitis of the venous radicles takes place.

The gravity of the situation commences from this period. Not only does the area of the inflammatory extension become wider and wider, but *pari passu* the infective thrombophlebitis also extends much beyond the focus of infection, ultimately involving the main divisions of the anterior facial vein. Two serious complications now arise. The one which occurs early is the invasion of the general blood stream by the infective organisms due to the septic thrombi being swept into the circulation. A septicæmia and, often, a septicopyæmia of a very virulent type develops in the majority of the fulminant cases. The other complication is dependent on the venous obstruction and the consequent retardation of circulation in the affected area. As a result of this latter phenomenon the loose cellular tissues are rapidly distended with

effusion of serum causing œdema and swelling. If an incision is made into this part there is an exudation of a copious sero-sanguineous fluid which does not contain any pus. But when the part is squeezed small drops of purulent matter may be found to come out as little yellowish beads scattered in the subcutaneous tissues. These latter are the venous radicles which have undergone thrombosis (plate VII, figure 1). The histological picture of a piece of tissue from such an area is very characteristic. The lumina of the vessels are seen to be occupied by thrombi consisting of fibrin, red cells, pus cells and clumps of cocci while the tissues around the vessel show absolutely no sign of inflammation (plate VII, figures 2 and 3). In the later stages, however, the infection spreads into the neighbouring fatty tissues producing a picture of an acute suppurative inflammation (plate VII, figures 4 and 5).

With the vascular thrombosis and the consequent retardation of venous flow, it becomes increasingly difficult for the opsonins, agglutinins and other bactericidal substances in the blood to reach the site of infection particularly when the tissues are under tension. Most of the leucocytes which had already been mobilized in the area are rapidly killed by the powerful toxins (leucocidins) of the organisms. As their further emigration to replace the dead ones becomes more and more difficult, there is neither an effective barrier to check the progress of the invading micro-organisms, nor is there any attempt to neutralize their toxins in the focal area. Lastly, the lack of flow of healthy blood into the affected region prevents the anti-tryptic action of the serum on the inflamed tissues. As a consequence the powerful tryptic ferment liberated by the molecular death and disintegration of tissue cells cannot be neutralized and accumulates in the infected place in sufficiently high concentration to give rise to further damage.

Thrombosis of the cavernous sinus is said to be very often associated with cellulitis of the face. Dorland Smith (1918) collected 140 cases of cavernous sinus thrombosis in which 44 per cent was due to infection of the face and nose. But, from a study of this series of cases, our observations showed a state of affairs somewhat different from the usual conception. Proptosis, which is one of the cardinal signs of this complication, could not be clinically demonstrated, as there was marked œdema of the eyelids and chemosis of the conjunctiva. In six cases only were there reasons to suspect cavernous sinus thrombosis, and in one case jugular thrombosis. A large number of autopsy examinations are, however, necessary to decide this question. Cavernous sinus thrombosis and involvement of the meninges would certainly take place if the patients survive long enough, but usually they die of toxæmia before such extensions have time to develop. In two cases,

which were available for autopsy, we found not only involvement of these structures but also marked purulent basic meningitis extending as far backwards as the cerebellum. In our series of 55 cases, lumbar puncture was done in eleven cases exhibiting symptoms of cerebral irritation, and the cerebro-spinal fluid was found to be clear in all except one. The bacteriological examination was also negative in most of them.

Bacteriology.—The 55 cases in our series were subjected to a thorough bacteriological study as far as practicable, according to the following scheme:—

1. Examination of the material obtained from the area of the primary infection.

2. Examination of small bits of tissue excised aseptically from near the infected area. For obvious reasons, the scope of such an examination was very limited.

3. Blood culture.

4. Culture of the cerebro-spinal fluid after lumbar puncture. This was carried out in 11 cases.

The following is the result of the bacteriological study of the blood:—

Total number of cases examined:	46	
Blood culture positive	..	39
Blood culture sterile	..	4
Contaminated	..	3
TOTAL	..	46

Out of the 39 positive cases:—

<i>Staphylococcus aureus</i>	..	32
<i>Staphylococcus albus</i>	..	1
<i>Streptococcus hæmolyticus</i> and <i>Staphylococcus aureus</i>	..	1
<i>Streptococcus hæmolyticus</i>	..	4
<i>Streptococcus viridans</i>	..	1
TOTAL	..	39

Of the cases where blood culture could not be done or it was sterile, on culture of the pus *Staphylococcus aureus* was isolated in 11 cases, and streptococcus and staphylococci in one only.

It is apparent from the above that the staphylococcus is by far the most common and predominating organism, having been isolated from the blood in 85 per cent of the cases. The recovery of the organisms from the blood as early as the second or the third day signifies an early invasion of the blood stream, producing septicæmia.

Study of the cerebro-spinal fluid

Lumbar puncture done in 11 cases.

Character of the fluid:—Clear in 10.

Turbid in 1.

Pressure:—

No tension—7 cases.

Under slight tension—3 cases.

Culture:—

Under tension—1 case.

Negative in all except in one case where the intracranial tension was high and the fluid was turbid. Culture showed *Staphylococcus aureus* which was also recovered from his blood.

CLINICAL STUDY

Clinical types.—Inflammatory affections of the face, broadly speaking, manifest themselves in the following ways:—

(i) A pimple or a furuncle on the lip or any other part of the face remaining as such and ultimately healing up spontaneously.

(ii) A pimple or a furuncle spreading locally over a wider area and ultimately localizing in the form of an abscess or carbuncle, e.g., a labial carbuncle.

(iii) Fulminant type: (a) Acute.—The acute spreading cellulitis of the face originating from an injury or a furuncle and rapidly spreading along the cellular tissues involving the whole face, the eyelids, the scalp, first on the side of the affection and then the other side, also down to the neck, and in some cases as far as to the chest wall and back (plate VII, figure 4).

(b) Subacute.—Starting as an acute case but running a more prolonged course and ultimately localizing with the formation of small abscesses here and there.

In this paper our observations will be limited to the third type of lesion.

Clinical picture.—The clinical picture of a typical primary cellulitis of the face is very characteristic (text-figure 2). It usually starts



Text-figure 2.—Photograph of a typical case of facial cellulitis affecting the left side of the face, eye, parotid and submaxillary regions (case 33).

from a very trivial infection or injury such as a pimple in the face area. The patient complains of a tense pain around the focus of inflammation which remains localized for a day or two

The head of the pimple sometimes bursts accidentally but more often it is squeezed out by the patient himself or by his ignorant friends 'to get the core out'. If the histories of the cases are properly enquired into, it is curious to find how quickly after such an interference the inflammation commences to spread and the constitutional symptoms appear. Once started the inflammation proceeds by leaps and bounds involving the lips, the tissues of the face, the sides of the nose and the eyelids and so on, practically involving the whole of the face and eyelids and extending to the opposite side and to the scalp.

In cases where the original mischief is situated in the lower lip or below the line of the angle of the mouth the upward extension of the inflammation is found to be limited or delayed. In such cases the cellulitis has a tendency to spread downwards along the chin and the lower jaw to the region of the neck. An extension of inflammation from the face to the scalp is much more widespread than one from the scalp to the face. In the latter, the extension has a tendency to remain limited to the upper part of the face involving the bridge of the nose and the eyelids. It is not often seen to reach below the level of the malar bones and the zygoma.

The inflamed area becomes oedematous and swollen. Before the actual inflammatory mischief is settled in the swollen tissues there is often a preceding non-inflammatory oedema, which is shown by the absence of tenderness and a red flush. In dark-skinned people, however, the reddish hue over inflammatory areas is not characteristic. It is apparent only in the fair-skinned individuals, while in others it takes on a reddish-brown or dusky hue. The skin over the oedematous area becomes shiny in places, and vesicular and pustular eruptions may be seen on the surface now and then. The pustules when broken exude a small bead of pus exposing a raw congested base without any communication with deeper cellular planes.

The mucous membrane inside the mouth becomes turgid, its endothelium is lost and the surface soon becomes raw and covered with a membranous deposit. Further, as a result of the inflammatory tumefaction, the cheek presses against the teeth and gums and thus becomes ulcerated. When the membranes are cleared out, raw areas are exposed and small punctiform hæmorrhages may appear on the surface. At times purulent discharge is seen to exude through the ulcerated areas. The patient can neither open his mouth freely nor protrude his tongue. In extreme cases, the inflammation of the mucous membrane may spread as far back as the retropharyngeal space, causing dysphagia. Speech becomes indistinct and at times impossible. Oedema of the glottis may develop but was not met with in any of the cases of this series.

When the disease starts in the lips the latter become considerably thickened and everted (text-figure 3). In a typical labial carbuncle points of pus are scattered over the whole



Text-figure 3.—Photograph of a case of facial cellulitis starting in the lower lip which is swollen, thickened and considerably everted keeping the mouth open. The cellulitis has spread downwards below the chin to the neck and chest (case 39).

surface of the affected lip (text-figure 4). As the lips cannot be apposed the mouth always remains open. Saliva constantly dribbles out and the mouth and tongue become dry; this causes much discomfort and inconvenience to the patient. When the inflammatory process starts in the nose the mucous membrane becomes turgid. There may be sanguineous or sanguinopurulent discharge from the nose. Breathing through it becomes more or less obstructed leading to forced mouth breathing with all its disadvantages. A case came under observation of one of the writers where submucous suppuration and sloughing followed over the septum of the nose causing its extensive destruction.

The swelling of the eyelids is always present except in some cases of infection starting in the lower lip or where the patients die before the cellitic process has had time to spread widely. It appears early affecting first the lids on the affected side and in many cases gradually progressing to the other. To start with, the oedema may be non-inflammatory but active inflammation soon settles in the oedematous tissue and the lids are found swollen, tense, and closed. In some cases they are firmly apposed to each other being glued together by exudates

and it becomes impossible to open them (text-figure 5). Chemosis varies with the intensity of the inflammation. The affected eye looks more prominent. Actual proptosis (text-figure 6) of the eyeball is not frequently seen, but it



Text-figure 4.—Photograph of a case of facial cellulitis starting in the lower lip and localizing in the form of a typical labial carbuncle (case 29).

is difficult to detect slight degrees of this condition due to prominence of the affected eyelids. When it is present, it indicates exudation inside the orbital cellular tissues as a result of extension of the inflammation and consequent vascular stasis. Although it is one of the cardinal signs of cavernous sinus thrombosis it is not possible to say definitely by this sign alone that the thrombosis has reached right up to the sinus. The movement of the eyeball is greatly impaired. Vision is maintained though gradually diminished. It is seldom lost unless some complication like extensive corneal ulceration or prolapse of the iris develops (text-figure 7). Two of our patients (cases 7 and 27) lost their left eyes through this cause. The diminution of vision is caused by extension of inflammation in the retrobulbar cellular tissues causing congestion of the retinal veins, exudation into the vitreous, pressure on the optic nerve or is occasionally perhaps due to direct extension of inflammation into the



Text-figure 5.—Photograph of a case of facial cellulitis showing extensive involvement of both the eyes. The lids are much swollen and cedematous and the eyes are tightly closed. The lids are glued together and can hardly be separated (case 16).



Text-figure 6.—Photograph of a case of facial cellulitis showing marked proptosis as a result of cavernous sinus thrombosis (case 35).



Text-figure 7.—Photograph of a case who has recovered from facial cellulitis showing loss of left eye due to sloughing of the cornea and prolapse of the iris (case 27).



Text-figure 8.—Photograph of a case of facial erysipelas caused by *Streptococcus hæmolyticus* showing characteristic lesions which are entirely different from those of facial cellulitis. There is no swelling and oedema; the rash is of a spreading character with involvement of the ear.

nerve. Mechanical closure of the eyelids consequent on the oedema make ophthalmoscopic examination very difficult. It was done only in a limited number of cases and mostly revealed congestion and oedema of the retina. It is not possible by ophthalmoscopic examination to determine if the venous congestion and thrombosis of the superior ophthalmic veins have progressed right up to the cavernous sinus. Mechanical fixation of the eyeball makes it difficult to investigate if the nerves supplying the muscles of the eyeball running through the cavernous sinus are affected. Only in one case was divergent strabismus noted, indicating lesion of the third cranial nerve and suggesting extension of inflammation into the cavernous sinus.

Marked enlargement of the lymph nodes in the parotid, submaxillary or submental region was very seldom noticed in any of the cases. This appears to be due to the peculiarity of the lesion, *viz*, the limitation of the inflammation within the lumen of the veins and the pressure exerted by the tense cellular tissues on the delicate lymphatic vessels.

The picture of this type of cellulitis of the face is different from that of facial erysipelas (text-figure 8) which is due to the infection of the lymphatics and tissue spaces of the cutis by *Streptococcus hæmolyticus*. Here the area of inflammation is raised from the surface of the skin, the hair follicles over the inflammatory area are prominent, a definite spreading margin can be detected and the characteristic rash with formation of a bullous eruption is the striking feature. It has a particular tendency to spread into the ears. There is seldom any oedema or swelling of the tissues. The lymphatic glands are early affected, being enlarged, tender and painful.

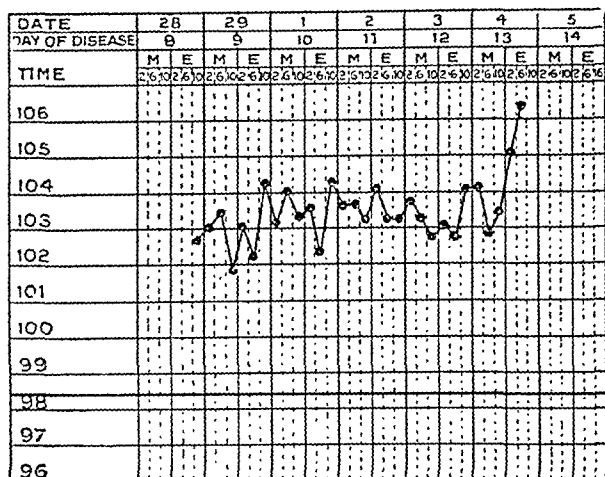
Systemic manifestations

The patients are ill from the beginning. They appear full in the face, agitated and more or less restless from the start. Almost with the commencement of the spread of inflammation the temperature is raised, with or without rigors, and maintains a high level. It is remittent in character with one or more rigors and more than one rise a day. Hyperpyrexia is not infrequently encountered (text-figure 9). The patients exhibit signs and symptoms of a severe toxæmia and almost all the vital organs are more or less affected.

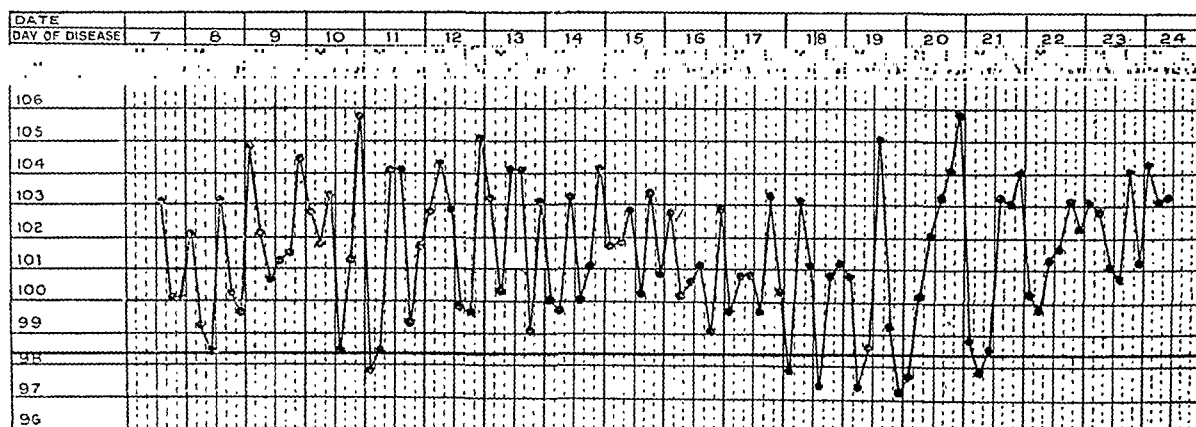
The pulse rate is increased from the very beginning. The character of the pulse is altered, *viz*, the tension falls; it becomes quick and dicrotic in nature. Patients perspire freely, specially at the height of the disease. In some cases, though the temperature remains high, the extremities are cold and there is profuse perspiration.

Pulmonary complications in the form of capillary bronchitis, pneumonia and bronchopneumonia very often crop up during the course

of the illness. They occurred in forty cases of this series. They are of grave prognostic significance. Of these, pleurisy occurred in three cases and hæmoptysis in one.



Text-figure 9.—Temperature chart of a fulminant case of facial cellulitis showing a high remittent type of temperature terminating in hyperpyrexia.



Text-figure 10.—Temperature chart of a case of jugular thrombosis showing repeated rises of temperature. Each rise was associated with rigor and convulsion (case 5).

The quantity of urine gradually diminishes. It becomes high coloured, usually acid in reaction and its specific gravity is raised. Albumin, red blood corpuscles and casts of all varieties may be present. Pus cells may be found in abundance and at times the urine is turbid. In one case it was frankly purulent. This was due to the development of pyæmic abscesses in the kidneys as was ascertained at autopsy.

Nervous system.—Restlessness is a marked feature. During the height of the fever the patients become very irritable and often definitely delirious. They resent interference and are very much agitated. At times they are boisterous. Though from anatomical considerations extension of inflammation into the meninges is a possibility, the typical clinical

manifestations of meningeal irritation and meningitis were absent in the majority of our cases. In the case where an autopsy was available, fairly extensive inflammation of the meninges, specially at the base, was seen with purulent exudate in the cisterna magna. This case showed, during life, marked stiffness of the neck and lower limbs, and a positive Kernig's sign. Lumbar puncture was performed in eleven cases exhibiting symptoms of cerebral irritation. In these, signs of increased intracranial pressure were not evident and no organisms grew on culture of the cerebrospinal fluid. In one case only the fluid came under pressure, was hazy and grew *Staphylococcus aureus* on culture, the organism being the same as that found in the blood and pus of the patient. Tremors and twitchings occasionally occur. Only in two cases were convulsions seen to take place with each rise of temperature. One of these patients (case 5) used to have three or four rigors a day. The symptoms very strongly suggest jugular thrombosis (text-figure 10). Paralysis was not noted in any of the cases. Paresis of the left upper and lower extremities was noted in one case of

right-sided facial and orbital cellulitis. In another case jerking and stiffness of the neck with occasional convulsions of the Jacksonian type starting from the lower extremities was noticed. Definite evidences of extension of inflammation inside the skull are not frequently obtained. The symptoms of cerebral irritation are therefore generally due to congestion of the brain and toxæmia.

Treatment

From what has already been said about the nature of infection and the morbid anatomy of the condition, the treatment is likely to be successful if we can find out means to prevent an early onset of blood infection, to hold back the dislodgment of infective thrombi which are set free in the circulation and to check the

development and rapid spread of infective thrombophlebitis into the cavernous sinus and the jugular vein. The administration of a specific remedy to counteract the effects of the invading micro-organism, *viz.* the staphylococci, will help in the successful treatment of these cases. None of these is however easy to achieve and the mortality rate, as proved in our cases, is very high.

The treatment of these cases may be discussed under two heads:—

(1) Management of the local infection.

(2) Treatment of the septicaemia.

(1) *Management of the local infection.*—

(a) Prophylaxis. This consists in considering all cases of inflammatory mischief in the region of the face seriously. Their surroundings should be kept clean and hot fomentations applied on them. They should not be disturbed in any way. All temptations to squeeze them, prick them or incise them to relieve the pain and cut short the attack should be resisted before thorough localization has taken place. There is no doubt that the bulk of the cases get cured spontaneously. At the same time it is true that no one can anticipate which is going to fulminate.

(b) When the inflammation has commenced to spread, treatment should be directed to keeping up the vascularity of the part and adopting such means as would bring into the seat of mischief the defensive forces of the body. This is best done by applying over the inflammatory area thick hot moist fomentations with several pieces of lint having openings for the eyes, nostrils and the mouth. They should be frequently changed. Local applications of ichthyol and belladonna relieve the pain to a certain extent. It should be noted that in some cases during the first forty-eight hours or so hot fomentations are not well tolerated. In such cases, one should be satisfied with applications of ichthyol and belladonna or soaking the part with a saturated solution of magnesium sulphate. Fomentation, however, should be commenced as soon as it can be tolerated.

Attention should be directed to the proper cleaning of the mouth, eyes and nostrils, regularly and frequently. The gums should be swabbed with hydrogen peroxide and the mouth cleaned with some antiseptic gargle such as listerine. In those patients who cannot gargle, the mouth should be syringed out. Croupous exudates, when present on the cheeks or lips, should be removed, if this can be done easily, with swabs, and the raw oozing surfaces painted over with mild antiseptic emollients, such as glycerine and acid tannic, which keeps them sweet. The nostrils should be similarly cleaned when necessary.

The care of the eyes is very essential. Unless this is done it may be difficult to prevent corneal ulceration. The muco-purulent discharges from the oedematous lids should be

frequently swabbed off with sterile boric lotion or normal saline and the palpebral tissue cleaned. Half per cent mercurochrome solution should be instilled into the conjunctiva. Hot fomentations should be applied frequently over the inflamed eyelids.

When the inflammation spreads to the throat hot fomentation should be applied to the neck and submaxillary region. With the slightest evidence of pulmonary mischief steam inhalation should be commenced.

The question of operations has often to be faced and decided upon: it has always been a moot problem and divergent views have been held by different authorities from time to time. Martin (1922) in his instructive article on 'Infections of the face and lips' has quoted the views of various authorities on the point, and the article may be read with benefit by those interested in the subject. With the progress of our knowledge of the pathology of acute infections, the line of treatment has undergone considerable changes and at the present moment there are very few surgeons who would like to chase acute inflammatory mischief with the knife. While investigating the history of origin of these spreading inflammations, how often do we find that the spread commenced from a small furuncle immediately after squeezing or pricking it. Such a history tends to prove that the injury destroyed the leucocytic barrier letting loose the infecting organisms to invade the surrounding tissues. Incisions at random through spreading inflammatory areas (text-figure 11) will serve to



Text-figure 11.—Photograph of a case of facial cellulitis in which an incision gave rise to a fulminant spread of the inflammation ending in death (case 23). The marks of incisions may be seen on the parotid region and the chin.

Summary of cases

Serial number	Age in years	Sex	Religion	Day of illness	Day of result *	Site of primary lesion	History of trauma	Extension	Eye changes	Clinical evidence of cavernous sinus thrombosis	Lungs
1	40	M.	H.	8th	8th	Pimple right angle of mouth.	..	Right face, scalp, neck, multiple pustules.	Œdema, right eyelids, tightly closed.	Nil	Broncho-pneumonia.
2	14	M.	H.	4th	5th	Pimple on forehead.	Nil	Forehead, eyebrows, zygoma up to parotid area.	Œdema lids, tightly closed.	Nil	Free
3	30	F.	H.	7th	10th	Pimple on forehead.	Scratched	Right half of forehead, upper part of face.	Eyes swollen, œdematous.	Nil	Broncho-pneumonia.
4	30	M.	H.	8th	11th	Right upper lip.	Nil	Neck and forehead.	Conj. swollen, chemosis.	Proptosis	Broncho-pneumonia.
5	22	M.	H.	13th	21st	Left angle of mouth.	Trauma and incision.	Face, scalp, over the parotid submaxillary regions and left side of neck. Pus formation in these areas.	Lids swollen, closed, chemosis conjunctiva, sero-purulent discharge. Suppurative eyelid	Nil	Free
6	40	M.	H.	4th	5th	Ulcer nasolabial fold	Nil	Left side of neck, cheek and nose.	Lids œdematous	Nil	Broncho-pneumonia.
7	20	M.	H.	4th	45th	Pimple lip	Scratched	Face and scalp both sides.	Œdema lids, chemosis, corneal ulcer.	Nil	Free
8	25	M.	H.	4th	4th	Angle of mouth.	Scratched	Right face and neck much swelling.	Nil	Nil	Bronchitis
9	29	F.	A.-I.	9th	13th	Pimple angle of mouth.	Pricked	Face both sides scalp, neck.	Lids swollen, chemosis.	Nil	Crepitations, friction rub.
10	35	M.	H.	5th	22nd	Pimple upper lip.	Pricked	Whole face	Lids swollen, chemosis.	Nil	Bronchitis
11	26	M.	H.	12th	13th	Lower lip	Pricked and shaved by barber.	Face and neck	Lids swollen, œdematous.	Nil	Broncho-pneumonia.
12	50	M.	H.	5th	..	Pimple nose	Pricked	Nose and both cheeks, swollen, œdematous, tense.	Lids œdematous	Nil	Free
13	44	F.	H.	9th	..	Angle of mouth.	Nil	Whole of face, submaxillary and parotid region.	Eyelids swollen, not closed, chemosis.	Nil	Rhonchi both sides.
14	42	M.	H.	11th	45th	Pimple left cheek.	Scratched	Whole face, scalp, neck and back.	Eyelids just swollen.	Nil	Free
15	35	M.	H.	9th	12th	Lower lip	Scratched accidentally.	Upper lip, face, submental region	Nil	Nil	Broncho-pneumonia.
16	35	F.	A.-I.	7th	11th	Lower lip	Scratched	Chin, face, forehead, carbuncle lower lip.	Lids swollen, closed, chemosis.	Nil	Pneumonia right base.
17	27	M.	H.	5th	10th	Upper lip	Nil	Upper lip, whole right side of face, neck.	Lids, swollen chemosis, abscess of eyelid.	Nil	Broncho-pneumonia.
18	21	M.	M.	4th	10th	Right upper oral margin	Scratched	Face, lips studded with pus points, m. m. of mouth.	Right eye closed, chemosis of conjunctiva.	Nil	Broncho-pneumonia.
19	28	M.	H.	27th	30th	Right ear furuncle.	Nil	Face, submaxillary region, neck, scalp.	Lids œdematous but open.	Nil	Broncho-pneumonia.
20	35	M.	H.	8th	34th	Fish bone stuck in lip.	..	Face and parotid region.	Lids œdematous, fissure narrowed.	Nil	Free

* Death (D)

of rapidly-spreading cellulitis

C. N. S.	Toxemia	Blood culture	Pus culture	Urine	C. S. fluid	Treatment	Result	ADDITIONAL REMARKS
Semi-conscious.	+	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Scanty albumin, casts.	..	No serum; glucose and iodine.	D	Admitted in a moribund condition.
Nil	Nil	Contaminated.	<i>Staph. aureus.</i>	No change	..	Serum, glucose and mercurochrome.	C	....
Delirious ++.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	High coloured, albumin, casts.	..	Serum, iodine and glucose.	D	....
Delirious	+	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum and glucose	D	Fundus normal.
Delirious ++.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Albumin, casts, red cells.	..	Serum, electrargol, iodine, glucose and urotropin.	D	Repeated rigors, oscillating temperature and jugular thrombosis. Blood sugar 0.16 per cent.
Delirious	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum and glucose	D	Superficial blebs on cheek.
Nil	Nil	Not done	<i>Staph. aureus.</i>	Albumin, granular casts.	..	Serum, iodine, vaccine and glucose.	C	Left eye blind. Small abscesses in other parts.
Delirious ++.	++	<i>Staph. aureus.</i> <i>Strepto. viridans.</i>	<i>Staph. aureus.</i>	Scanty	..	Serum and glucose	D	Admitted moribund.
Drowsy	+++	Not done	<i>Staph. aureus.</i>	..	..	Serum, iodine and glucose.	D	Incision on 6th day. Condition flared up.
Nil	+	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum, iodine and glucose.	C	Hyperpyrexia.
..	++	Not done	<i>Staph. aureus.</i>	..	..	Serum, iodine and glucose.	D	Localized as labial carbuncle.
..	Moderate	Sterile	<i>Strepto. and Staph. aureus.</i>	..	..	Serum, iodine and glucose.	C	Pustules on lips; cannot open mouth.
Conscious till end.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Albumin, hyaline casts.	..	Serum, iodine and glucose.	D	....
Restless	Not marked.	<i>Strepto. viridans.</i>	Contaminated.	Albumin, hyaline granular casts.	..	Serum, iodine, vaccine and glucose.	C	Retrosternal pain.
Vasomotor disturbance.	+++	<i>Staph. aureus.</i>	Not done	Albumin casts.	..	Serum, lactolan, iodine and glucose.	D	Delirium at height of fever.
Delirious ++.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum, iodine and glucose.	D	Blood sugar 0.22 to 0.25 per cent. Surface temperature—normal.
Irritability	++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Scanty	..	Serum, iodine and glucose.	D	Rectal—103°F.
Delirious	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i> <i>Strepto. hæmolyticus.</i>	..	..	Serum, iodine and glucose.	D	Difficulty in deglutition.
Nil	++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Albumin, sugar, casts.	..	Serum, iodine and glucose.	D	Purulent discharge from eyes.
Nil	Marked at the start only.	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum, iodine and glucose.	C	....
								Started acutely, gradually localized, forming abscess.

or cure (C).

Summary of cases

Serial number	Age in years	Sex	Religion	Day of illness	Day of result *	Site of primary lesion	History of trauma	Extension	Eye changes	Clinical evidence of cavernous sinus thrombosis	Lungs
21	9	M.	H.	5th	9th	Pimple upper lip.	Squeezed	Lip, face, neck, m. m. of mouth.	Œdema of lids	Nil	Bronchitis
22	28	F.	H.	6th	8th	Pimple upper lip.	Squeezed	Face, parotid region, neck and scalp.	Œdema lids, chemosis.	Nil	Broncho-pneumonia.
23	22	M.	H.	9th	9th	Furuncle angle of mouth.	Incised	Face, neck, parotid region.	Lids swollen, marked chemosis.	Nil	Broncho-pneumonia.
24	45	M.	H.	2nd	10th	Furuncle face.	Nil	Left eye, neck, chest.	Lids puffy, eyes not closed.	Nil	Free
25	25	F.	H.	4th	11th	Pimple at angle of mouth.	Scratched	Face and m. m. of mouth.	Free	Nil	Bronchitis, pneumonia.
26	27	M.	H.	6th	10th	Pimple lower lip.	Squeezed	Face, neck, mouth swollen, red, tender.	Œdema eyelids, chemosis.	Nil	Free
27	27	M.	H.	30th	60th	Pimple face.	Nil	Left face, scalp, abscess on left eyebrow.	Left eye, sloughing cornea, prolapse iris.	Nil	Free
28	3	M.	H.	8th	9th	Indefinite	Nil	Forehead, both eyes, face up to malar region.	Œdema eyelids, chemosis.	Paralysis ext. rectus left eye.	Broncho-pneumonia.
29	28	F.	H.	4th	26th	Carbuncle lower lip.	Nil	Lower lip, cellulitis neck, face slightly involved.	No change	Nil	Pleurisy
30	25	M.	H.	4th	..	Inner angle left lower eyelid.	Nil	Both eyes, left cheek, forehead, parotid region.	Both eyes swollen, conj. chemosis, conjunctivitis.	Suggestive	Broncho-pneumonia.
31	30	M.	H.	7th	7th	Furuncle face.	Burst by itself.	Whole face, sub-maxillary region.	Right eye, œdema, chemosis, lids closed.	Nil	Broncho-pneumonia.
32	25	M.	M.	2nd	3rd	Pimple face.	Squeezed	Left face	Eyelids œdematous.	Nil	Bronchitis, extreme dyspnoea. Capillary bronchitis.
33	26	M.	H.	7th	10th	Furuncle angle of nose.	Squeezed	Left face, cheek, nose, parotid region, eyelids.	Eyelids swollen. conj. chemosis.	Nil	Free
34	35	M.	H.	4th	11th	Left face below angle of mouth.	Nil	Superficial face up to neck and chest wall. Gradually to right face, ear not involved.	Not involved, slight puffiness of both the lower eyelids.	Nil	Free
35	14	M.	H.	7th	10th	Pimple nose.	Scratched	Whole face, eyelids, scalp.	Œdema lid, chemosis.	Right eye proptosis, rigidity neck, Kernig +.	Broncho-pneumonia.
36	35	M.	H.	10th	22nd	Swelling of face.	Incised from inside.	Whole right face, nose, eyelids.	Œdema lids, chemosis of conj.	Nil	Bronchitis
37	35	M.	H.	17th	18th	Gumboil lower jaw.	Incised from outside.	Whole face, sub-maxillary and parotid region, neck.	Œdema lids, conj. congested, dim vision.	Proptosis	..
38	25	M.	H.	6th	7th	Pimple cheek, 1½ inches lateral to lower lip.	Scratched	Both lips, left face, nasal m.m.	Left lid œdema congested, ecchymotic.	Nil	Free
39	31	M.	H.	10th	11th	Pimple lower lip.	Scratched in shaving.	Left face, chin, neck, lips, up to chest wall.	Lids swollen, left side.	Nil	Catarrhal condition.

* Death (D)

of rapidly-spreading cellulitis—contd.

C. N. S.	Toxæmia	Blood culture	Pus culture	Urine	C. S. fluid	Treatment	Result	ADDITIONAL REMARKS
Restless, delirious.	++	<i>Staph. aureus.</i>	<i>B. subtilis</i> and <i>Staph. aureus.</i>	..	..	Serum, iodine and glucose.	D	Mistaken for erysipelas.
Delirious	++	Not done	<i>Staph. aureus.</i>	..	..	Serum	D	Repeated rigors.
Delirious ++.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Scanty, high coloured.	..	Serum, iodine and glucose.	D	Temperature high. Two rises a day.
Delirious ++.	+++	No growth	Not available.	..	..	Serum, iodine and glucose.	D	....
Irritability	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Albumin trace, no casts.	No pressure, clear, sterile.	Iodine, serum, mercurochrome, selective vaccine and glucose.	D	....
Nil	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Scanty	..	Serum, mercurochrome and glucose.	D	Pyorrhœa +++.
Nil	Moderate	<i>Strepto. hæmolyticus.</i>	<i>Strepto. hæmolyticus.</i>	..	..	Serum, iodine, vaccine and glucose.	C	Blind—left eye.
..	+++	Not done	<i>Staph. aureus.</i>	Albumin ++, no casts.	..	No serum	D	Ear not involved.
Nil	Moderate	<i>Staph. albus.</i>	<i>Staph. albus.</i>	..	..	Serum, iodine, glucose and vaccine.	C	Pleurisy persisted. Cured by localizing.
Irritable, neck rigid.	++	Not done	<i>Staph. aureus.</i>	..	..	Serum and immune blood.	D	Paresis of upper and lower limbs.
Semi-conscious, restless.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum and glucose	D	Dysphagia.
Nil	+++	Not done	<i>Staph. aureus.</i>	Albumin +++.	..	Serum and glucose	D	Fulminant. Died 3rd day. Dysphagia.
Delirious, irritable.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum and glucose	D	....
Nil	Slight	<i>Staph. aureus.</i>	..	..	..	Serum, glucose and milk.	C	....
Delirious ++.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Albumin +	..	Serum, mercurochrome and glucose.	D	Purulent basic meningitis. Cavernous sinus thrombosis, orbital cellulitis, abscesses in kidney and lungs.
Irritable	++	<i>Staph. aureus.</i>	..	Scanty	Normal pressure, sterile.	Serum, iodine, glucose and mercurochrome.	D	....
..	++	Not done	Not done	..	..	Serum, iodine and glucose.	D	Dysphagia.
Irritable, delirious.	+++	Contaminated.	Not done	Albumin +	Slightly under pressure, sterile.	Serum, iodine and glucose.	D	....
Delayed cerebation.	++	<i>Strepto. hæmolyticus.</i>	..	Albumin +, no sugar.	Normal pressure, clear, sterile.	Serum and glucose	D	....

or cure (C).

Summary of cases

Serial number	Age in years	Sex	Religion	Day of illness	Day of result *	Site of primary lesion	History of trauma	Extension	Eye changes	Clinical evidence of cavernous sinus thrombosis	Lungs
21	9	M.	H.	5th	9th	Pimple upper lip.	Squeezed	Lip, face, neck, m. m. of mouth.	Œdema of lids	Nil	Bronchitis
22	28	F.	H.	6th	8th	Pimple upper lip.	Squeezed	Face, parotid region, neck and scalp.	Œdema lids, chemosis.	Nil	Broncho-pneumonia.
23	22	M.	H.	9th	9th	Furuncle angle of mouth.	Incised	Face, neck, parotid region.	Lids swollen, marked chemosis.	Nil	Broncho-pneumonia.
24	45	M.	H.	2nd	10th	Furuncle face.	Nil	Left eye, neck, chest.	Lids puffy, eyes not closed.	Nil	Free
25	25	F.	H.	4th	11th	Pimple at angle of mouth.	Scratched	Face and m. m. of mouth.	Free	Nil	Bronchitis, pneumonia.
26	27	M.	H.	6th	10th	Pimple lower lip.	Squeezed	Face, neck, mouth swollen, red, tender.	Œdema eyelids, chemosis.	Nil	Free
27	27	M.	H.	30th	60th	Pimple face.	Nil	Left face, scalp, abscess on left eyebrow.	Left eye, sloughing cornea, prolapse iris.	Nil	Free
28	3	M.	H.	8th	9th	Indefinite	Nil	Forehead, both eyes, face up to malar region.	Œdema eyelids, chemosis.	Paralysis ext. rectus left eye.	Broncho-pneumonia.
29	28	F.	H.	4th	26th	Carbuncle lower lip.	Nil	Lower lip, cellulitis neck, face slightly involved.	No change	Nil	Pleurisy
30	25	M.	H.	4th	..	Inner angle left lower eyelid.	Nil	Both eyes, left cheek, forehead, parotid region.	Both eyes swollen, conj. chemosis, conjunctivitis.	Suggestive	Broncho-pneumonia.
31	30	M.	H.	7th	7th	Furuncle face.	Burst by itself.	Whole face, sub-maxillary region.	Right eye, œdema, chemosis, lids closed.	Nil	Broncho-pneumonia.
32	25	M.	M.	2nd	3rd	Pimple face.	Squeezed	Left face	Eyelids œdematous.	Nil	Bronchitis, extreme dyspnoea. Capillary bronchitis.
33	26	M.	H.	7th	10th	Furuncle angle of nose.	Squeezed	Left face, cheek, nose, parotid region, eyelids.	Eyelids swollen. conj. chemosis.	Nil	Free
34	35	M.	H.	4th	11th	Left face below angle of mouth.	Nil	Superficial face up to neck and chest wall. Gradually to right face, ear not involved.	Not involved, slight puffiness of both the lower eyelids.	Nil	Free
35	14	M.	H.	7th	10th	Pimple nose.	Scratched	Whole face, eyelids, scalp.	Œdema lid, chemosis.	Right eye proptosis, rigidity neck, Kernig +.	Broncho-pneumonia.
36	35	M.	H.	10th	22nd	Swelling of face.	Incised from inside.	Whole right face, nose, eyelids.	Œdema lids, chemosis of conj.	Nil	Bronchitis
37	35	M.	H.	17th	18th	Gumboil lower jaw.	Incised from outside.	Whole face, sub-maxillary and parotid region, neck.	Œdema lids, conj. congested, dim vision.	Proptosis	..
38	25	M.	H.	6th	7th	Pimple cheek, 1½ inches lateral to lower lip.	Scratched	Both lips, left face, nasal m. m.	Left lid œdema congested, ecchymotic.	Nil	Free
39	31	M.	H.	10th	11th	Pimple lower lip.	Scratched in shaving.	Left face, chin, neck, lips, up to chest wall.	Lids swollen, left side.	Nil	Catarrhal condition.

* Death (D)

of rapidly-spreading cellulitis—concl'd.

C. N. S.	Toxemia	Blood culture	Pus culture	Urine	C. S. fluid	Treatment	Result	ADDITIONAL REMARKS
..	..	<i>Staph. aureus.</i>	<i>Staph. aureus</i> from vesicles.	..	Normal pressure, clear, sterile.	Serum, iodine and glucose.	D	....
Delirious	..	<i>Staph. aureus.</i>	..	Albumin, acetone.	Normal pressure, clear, sterile.	Serum, iodine, glucose and vaccine.	D	....
Delirious	+	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	Normal pressure, clear, sterile.	Serum, iodine and glucose.	D	....
Delirious	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	Albumin ++, granular casts.	Normal pressure, clear, sterile.	Serum and glucose	D	Hæmoptysis.
Drowsy	++	Not done	<i>Staph. aureus.</i>	..	..	Serum and glucose	D	Acute course.
Delirious	+	<i>Staph. aureus.</i>	..	..	..	Serum and glucose	D	Fulminant case.
Nil	++	<i>Staph. aureus.</i>	..	Albumin; red cells, pus cells, no casts.	..	Serum, mercurochrome and glucose.	D	....
Restless	+++	<i>Staph. aureus.</i>	..	..	..	Serum, glucose and iodine.	D	....
Restless, delirious.	Appeared on 6th day.	<i>Staph. aureus.</i>	..	..	..	Serum, mercurochrome and glucose.	D	....
Restless, delirious.	+++	<i>Staph. aureus.</i>	..	..	Slightly under pressure, clear, sterile.	Serum, glucose and iodine.	D	Fulminant.
Delirious, rigid neck, convulsions.	+++	<i>Strepto. hæmolyticus.</i>	..	..	Under pressure, clear, sterile.	Serum, iodine and glucose.	D	Fulminant. Meningo-encephalitis, cavernous sinus thrombosis.
Restless	+++	<i>Strepto. hæmolyticus.</i>	..	..	..	Serum, glucose and iodine.	D	....
..	+	No growth	..	Albumin granular casts, red cells.	..	Serum, glucose, iodine and vaccine.	C	Acute spreading cellulitis for 5 days, then localizing into abscess.
..	Absent	No growth	<i>Staph. aureus.</i>	..	..	Serum, milk and glucose.	C	Ended in labial carbuncle and abscess on ramus of mandible.
Delirious, drowsy.	+++	<i>Staph. aureus.</i>	<i>Staph. aureus.</i>	..	..	Serum, electrargol and glucose.	D	....
..	+++	Contaminated.	<i>Staph. aureus.</i>	..	..	Serum and glucose	D	....

or cure (C)

7 and 15) autovaccines prepared from the pus were used. In the other cases selective vaccines from preserved strains of staphylococcus from cases of facial cellulitis were used.

Bactericidal drugs.—Daily intravenous injections of iodine were used in 34 cases. In 11 of them the drug was used along with other remedies, viz, vaccine, lactolan, mercurochrome, urotropine. In the remaining 23 cases it was

used alone. Intravenous injections of mercurochrome were given in seven cases (cases 2, 25, 26, 35, 36, 46 and 48). In two cases it was used along with iodine and in one case with vaccine. Electrargol was used in two cases only.

A general scheme of treatment by various drugs with result in every case is given below for ready reference.

Scheme of treatment by various drugs

	Antisera	Glucose, intravenous and intra-muscular	Iodine, intravenous (daily)	Mercurochrome, intravenous, every other day, $\frac{1}{2}$ per cent sol., 2 to 5 c.c.	Vaccine	Nature of infection	Result	REMARKS, AND ADDITIONAL TREATMENT
1	—	+	+	—	—	<i>Staph. aureus</i>	Died	
2	+	+	—	+	—	Do. (pus)	Cured	Only pus culture done.
3	+	+	+	—	—	Do.	Died	
4	+	+	+	—	—	Do.	"	Electrargol.
5	+	+	+	—	—	Do.	"	
6	+	+	—	—	—	Do.	"	
7	+	+	+	—	+	Do. (pus)	Cured	Only pus culture done.
8	+	+	—	—	—	<i>Staph. aur.</i> <i>Strepto. viridans</i>	Died	
9	+	+	+	—	—	Do.	"	Only pus culture done.
10	+	+	+	—	—	<i>Staph. aur.</i> (pus)	Cured	
11	+	+	+	—	—	Do. (pus)	Died	Only pus culture done.
12	+	+	+	—	—	<i>Staph. aur.</i> and <i>Strepto.</i> (pus).	Cured	Blood culture sterile.
13	+	+	+	—	—	<i>Staph. aur.</i>	Died	
14	+	+	+	—	+	<i>Strepto. viridans</i>	Cured	Pus culture contaminated.
15	+	+	+	—	—	<i>Staph. aur.</i>	Died	Complicated with diabetes; non-specific-protein therapy.
16	+	+	+	—	—	Do.	"	
17	+	+	+	—	—	Do.	"	
18	+	+	+	—	—	Do.	"	Pus culture. <i>Staph. aur.</i> <i>Strepto. hæmolyticus</i> .
19	+	+	+	—	—	Do.	"	
20	+	+	+	—	—	Do.	"	
21	+	+	+	—	—	Do.	Cured	
22	+	+	—	—	—	Do. (pus)	Died	
23	+	+	+	—	—	Do.	"	Only pus culture done.
24	+	+	+	—	—	Do.	"	
25	+	+	+	—	—	Sterile	"	
26	+	+	+	+	—	<i>Staph. aur.</i>	"	
27	+	+	—	+	+	Do.	"	
28	—	—	+	—	+	<i>Strepto. hæmolyticus</i>	Cured	
29	+	+	+	—	—	<i>Staph. aur.</i> (pus)	Died	Only pus culture done.
30	+	+	+	—	+	<i>Staph. albus</i> <i>Staph. aur.</i>	Cured	
31	+	+	—	—	—	Do.	Died	Only pus culture. Immune blood transfusion.
32	+	+	+	—	—	Do.	"	
33	+	+	—	—	—	Do. (pus)	"	Only pus culture done.
34	+	+	—	—	—	Do.	Cured	Non-specific-protein therapy.

break any attempt at localization, open blood vessels which, lying in the oedematous tissues, fail to contract and close. This affords facilities to the ingress of organisms to the circulation, if this has not already happened, thereby helping to convert a localizing infection into a generalized one. Further, such a trauma helps considerably to dislodge the infective thrombi into the circulation. The duty of a surgeon is to help nature and not to destroy her protection. It is only when the inflammation has localized, as it does in some cases, and circumscribed abscesses have formed that the judicious use of a surgeon's knife will pilot the patient to safety.

While opening a localized abscess one should be cautious in this interference. Incisions should be so placed as to avoid injury to the blood vessels. Pus should be allowed to flow out by keeping the lips of the wound apart with sinus forceps, helped by gentle pressure. No attempt should be made to disturb the interior of the cavity with fingers or scraping it with instruments. Strips of dental rubber or gauze should be lightly placed in between the margins of the incision to prevent it from closing up rapidly. Small multiple incisions are always more useful than big mutilating ones which not only leave big scars but also serve to break the protective zones. Hot compresses should be continued even after the incisions have been made.

Ligature of the angular vein has been advocated and is practised by some surgeons (Roeder, 1928; Bailey, 1928). They seem to attribute too much importance to the factor of cavernous sinus thrombosis. It has been amply stressed in this communication that in these cases the mobilization of organisms in the blood and the distribution of pyæmic emboli in the circulation and their lodgment in the vital organs are important factors in determining the prognosis of these cases. A large number of cases have been recorded where death took place long before thrombosis could reach the cavernous sinus, or the inflammation could spread to the orbital tissues. Anatomical study further shows that the angular vein and its communication with the superior ophthalmic vein is not the only route along which infective thrombophlebitis can spread to the cavernous sinus. Even after the angular vein is tied the possibility of spread to the sinuses along the pterygoid plexus remains. We have not used the method in the treatment of our cases. It is therefore not possible for us to state as to what extent it alters the prognosis.

(2) *Treatment of septicæmia.*—To treat the septicæmia and combat toxæmia we have used specific antisera, non-specific proteins, vaccines and bactericidal drugs in the shape of intravenous injections of iodine, mercurochrome, and electrargol. Specific antisera have been our sheet-anchor in the treatment and the other

remedies mentioned above were used in addition to the antisera.

Injections of antisera.—In practice we find that with the idea that all these cases exhibiting severe toxæmia are infections caused by streptococci, large quantities of polyvalent anti-streptococcal serum are used. It is difficult to trace the reason for this belief. Probably, the bacteriology of the disease is not accurately appreciated. There was a time during the course of our investigations on these cases when we thought that failure to respond to serum treatment might be due to the neglect in using specific antisera, i.e., anti-staphylococcal sera. But with very careful and liberal use of anti-staphylococcal serum in a large number of our cases our expectations have not been fulfilled.

Of late, the value of antisera in cases of septicæmia is being doubted. There are, however, observers who hold that the use of antisera very early in the disease, given intravenously and in large doses, greatly helps to reduce the mortality rate. In a series of 27 cases our practice has been to give 40 c.cm. of polyvalent anti-streptococcus serum and 40 c.cm. of anti-staphylococcal serum as soon as the patient was admitted. Whenever possible the same dose was repeated within twenty-four hours. After the causative organism was isolated, further injections of the specific antiserum was continued. Injections were given by the intravenous route, except in those cases where there were evidences of vasomotor instability, or where the patient was running a very high temperature. Very seldom however were we able to start the injections within forty-eight hours. There were only five cases in this series who had serum treatment within the first forty-eight hours. Of these five patients four died and one lived. On the other hand six cases in this series with positive bacteriological findings in the blood lived even though serum treatment was delayed for five days and more. From the results of treatment, we are inclined to doubt the efficacy of serum treatment in cases of staphylococcal infection, but the results in cases of streptococcal infection seem to be more satisfactory. The unfavourable results obtained in our cases with antisera may to a certain extent be due to the fact that we did not get opportunities to use antitoxic sera, as they were not available here. More encouraging results with antitoxic staphylococcal serum in cases of staphylococcal septicæmia are reported by Pantón, Valentine and Dix (1931).

All the cases received injections of glucose liberally, by the intravenous route. Along with the serum, we used non-specific-protein therapy in cases 15, 34 and 55. Intramuscular injections of 5, 7 and 10 c.cm. were given every other day. Vaccines were used in four cases along with serum and other bactericidal drugs (cases 7, 15, 30 and 43). In two cases (cases

7 and 15) autovaccines prepared from the pus were used. In the other cases selective vaccines from preserved strains of staphylococcus from cases of facial cellulitis were used.

Bactericidal drugs.—Daily intravenous injections of iodine were used in 34 cases. In 11 of them the drug was used along with other remedies, viz, vaccine, lactolan, mercurochrome, urotropine. In the remaining 23 cases it was

used alone. Intravenous injections of mercurochrome were given in seven cases (cases 2, 25, 26, 35, 36, 46 and 48). In two cases it was used along with iodine and in one case with vaccine. Electrargol was used in two cases only.

A general scheme of treatment by various drugs with result in every case is given below for ready reference.

Scheme of treatment by various drugs

	Antisera	Glucose, intravenous and intra-muscular	Iodine, intravenous (daily)	Mercurochrome, intravenous, every other day, $\frac{1}{2}$ per cent sol., 2 to 5 c.c.	Vaccine	Nature of infection	Result	REMARKS, AND ADDITIONAL TREATMENT
1	—	+	+	—	—	<i>Staph. aureus</i>	Died	
2	+	+	—	+	—	Do. (pus)	Cured	Only pus culture done.
3	+	+	+	—	—	Do.	Died	
4	+	+	—	—	—	Do.	"	Electrargol.
5	+	+	+	—	—	Do.	"	
6	+	+	—	—	—	Do.	"	
7	+	+	+	—	+	Do. (pus)	Cured	Only pus culture done.
8	+	+	—	—	—	<i>Staph. aur.</i> <i>Strepto. viridans</i>	Died	
9	+	+	+	—	—	Do.	"	Only pus culture done.
10	+	+	+	—	—	<i>Staph. aur.</i> (pus)	Cured	
11	+	+	+	—	—	Do. (pus)	Died	Only pus culture done.
12	+	+	+	—	—	<i>Staph. aur.</i> and <i>Strepto.</i> (pus).	Cured	Blood culture sterile.
13	+	+	+	—	—	<i>Staph. aur.</i>	Died	
14	+	+	+	—	+	<i>Strepto. viridans</i>	Cured	
15	+	+	+	—	—	<i>Staph. aur.</i>	Died	Pus culture contaminated. Complicated with diabetes; non-specific-protein therapy.
16	+	+	+	—	—	Do.	"	
17	+	+	+	—	—	Do.	"	
18	+	+	+	—	—	Do.	"	Pus culture. <i>Staph. aur.</i> <i>Strepto. hæmolyticus.</i>
19	+	+	+	—	—	Do.	"	
20	+	+	+	—	—	Do.	"	
21	+	+	+	—	—	Do.	"	
22	+	+	—	—	—	Do. (pus)	Cured	
23	+	+	+	—	—	Do.	Died	Only pus culture done.
24	+	+	+	—	—	Sterile	"	
25	+	+	+	—	—	<i>Staph. aur.</i>	"	
26	+	+	—	+	+	Do.	"	
27	+	+	+	—	—	<i>Strepto. hæmolyticus</i>	Cured	
28	—	—	—	—	—	<i>Staph. aur.</i> (pus)	Died	Only pus culture done.
29	+	+	+	—	+	<i>Staph. albus</i>	Cured	
30	+	+	+	—	—	<i>Staph. aur.</i>	Died	Only pus culture. Immune blood transfusion.
31	+	+	—	—	—	Do.	"	
32	+	+	+	—	—	Do. (pus)	"	
33	+	+	—	—	—	Do.	"	Only pus culture done.
34	+	+	—	—	—	Do.	Cured	Non-specific-protein therapy.

Scheme of treatment by various drugs.—concl'd.

	Antisera	Glucose, intravenous and intra-muscular	Iodine, intravenous (daily)	Mercurio-chrome, intravenous, every other day, $\frac{1}{2}$ per cent sol., 2 to 5 c.c.	Vaccine	Nature of infection	Result	REMARKS, AND ADDITIONAL TREATMENT
35	+	+	—	+	—	<i>Staph. aur.</i>	Died	
36	+	+	+	+	—	Do.	"	
37	+	+	+	—	—	Not done	"	
38	+	+	+	—	—	Do.	"	
39	+	+	—	—	—	<i>Strepto. hæmolyticus</i>	"	
40	+	+	+	—	—	<i>Staph. aur.</i>	"	
41	+	+	+	—	+	Do.	"	
42	+	+	+	—	—	Do.	"	
43	+	+	—	—	—	Do.	"	
44	+	+	—	—	—	Do.	"	Only pus culture done.
45	+	+	—	—	—	Do.	"	
46	+	+	—	+	—	Do.	"	
47	+	+	+	—	—	Do.	"	
48	+	+	—	+	—	Do.	"	
49	+	+	+	—	—	Do.	"	
50	+	+	+	—	—	<i>Strepto. hæmolyticus</i>	"	
51	+	+	+	—	—	Do.	"	
52	+	+	+	—	+	Sterile	Cured	
53	+	+	—	—	—	<i>Staph. aur.</i>	"	Blood culture sterile. Non-specific - protein therapy. Electrargol.
54	+	+	—	—	—	Do.	Died	Only pus culture done.
55	+	+	—	—	—	Do. (pus)	"	

Prognosis.—Prognosis of cases of facial cellulitis is always very grave. The mortality in our series has been 80 per cent. Koslin (1931) reported a death rate of 33 per cent in his series of 18 cases. The determining factors that led to such a high mortality rate were :—

- (1) Early onset of septicæmia.
- (2) Spreading infective thrombophlebitis leading to cavernous sinus and jugular thrombosis and the development of embolic abscesses in vital organs, e.g., the lungs and kidneys.
- (3) Meningitis and meningo-encephalitis.

The nature of the infective organisms considerably affects the prognosis. In our series we have found the prognosis of cases infected with staphylococcus much more grave. This will be readily seen from the following figures* :—

	Total number of cases treated	Number of cases cured	Recovery rate
Staphylococcal infection	44	6	13.7 per cent
Streptococcal and staphylococcal infection.	2	1	50.0 "
Streptococcal infection	5	2	40.0 "
Sterile on culture ..	4	2	50.0 "

*[The difference between the mortality percentages in the staphylococcal and the non-staphylococcal cases is just 'significant' statistically.—Editor, I. M. G.]

The prognosis becomes still more gloomy in patients who are subjects of malnutrition or chronic debilitating diseases, such as diabetes, nephritis or splenomegaly.

Of the other factors that considerably affect the prognosis of these cases are the time when the patients are received for treatment and the injudicious interference to the inflammatory focus by the patients and their relations, or by the surgeon's knife. Though in our series cases are not wanting where patients died within such a short time after the onset of the inflammation that nothing could be done or where treatment, commenced early, failed to alter the course, there still exists a fairly large number of cases where treatment was not commenced till very late. The average duration of life was 9.5 days.

Conclusions

1. Fifty-five cases of facial cellulitis have been studied critically with reference to their ætiology, pathology, bacteriology, clinical manifestations and the effects of treatment.

2. The anatomical structures and the vascular connections always play important rôles in the pathogenesis of the malady and its subsequent course and prognosis.

3. *Staphylococcus aureus* constitutes the predominating organism amongst the bacterial

agents. The common idea that this condition is due to *Streptococcus hæmolyticus* is shown to be incorrect as far as Calcutta is concerned.

4. In the pathogenesis of the disease an early onset of virulent septicæmia dominates the picture, while spreading infective thrombophlebitis constitutes the most important pathological process in the infected area and its neighbourhood.

5. Extension of infection into the cavernous sinus or the meninges is not so frequent. The majority of the cases die of septicæmia before the infective thrombophlebitis has time to extend inside the skull.

6. Clinically, these cases exhibit signs and symptoms of a fulminant septicæmia with well-marked toxæmia. Pulmonary and cardiac involvements are always of serious significance.

7. In the matter of treatment, a policy of non-interference should be followed as a matter of choice. Except minor details regarding the management of the local area attention should be concentrated on the treatment of septicæmia with its accompanying toxæmia. The need for an effective specific antiserum for combating this infection is very great.

8. The mortality rate is always very high. In our series of cases, it is as high as 80 per cent. It is extremely doubtful if this high death rate can be altered by any form of treatment that is at present available.

It is our pleasant duty to thank Lieut.-Col. T. C. Boyd, I.M.S., Principal, Medical College, Calcutta, for facilities to carry on this investigation. We are also grateful to the various members of the house staff who have voluntarily worked hard for our sake in addition to their strenuous duties. Our special thanks are due to Drs. J. Banerji, M.B., and B. N. Mukerji, M.B., Clinical Pathologists, Medical College Hospitals, for their ungrudging help in the bacteriological study of these cases. For the diagrams and photomicrographs we are indebted to Mr. Sushil Bhattacharya.

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AN ENQUIRY INTO AN OUTBREAK OF CHOLERA IN BURMA WITH SPECIAL REFERENCE TO THE VALUE OF PREVENTIVE INOCULATION

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THIS account deals with the cholera epidemic which occurred in four districts of Lower Burma during the period November 1934 to May 1935.

The measures taken to combat the epidemic consisted of :

- (1) Disinfection of drinking supplies.
- (2) Disinfection of infected houses.
- (3) Treatment of cases (mostly in private houses).
- (4) Isolation (as far as practicable when dealing with the rural community).
- (5) Mass preventive inoculation with Kasauli anti-cholera vaccine, dose 1 c.cm.

With regard to this last measure, only those actually suffering from fever and very young infants were excused. Otherwise, the epidemic staff made every endeavour to inoculate as many as possible of the men, women and children exposed to risk in the areas visited.

Records were kept at the time of all who were inoculated, and, from these and the reports that reached the office of the Director of Public Health, the following tables have been compiled.

The tables show the incidence of cholera for the period November 1934 to May 1935 in the rural areas of Myaungmya, Bassein, Pyapon and Maubin districts. The population at risk has been arrived at after a very careful consideration of all the reports received throughout the epidemic. It is the total population of the particular village tracts visited during the epidemic by the public health staff, and is not the population of the whole township areas in which these village tracts are situated. Village tracts were visited either because actual cases were reported as having occurred, or because it appeared likely to the epidemic staff that the particular tract was in danger of infection.

In Myaungmya and Pyapon districts there were whole-time district health officers and in Bassein there was an assistant district health officer. It is considered that the cases reported to have occurred among the population inoculated and at risk represent the true state of affairs. It is unlikely that such cases would not have been reported to the epidemic staff even in the absence of the direct enquiries that were, in fact, made. These enquiries, it may be mentioned, were not entrusted to subordinates.

Myaungmya district (rural areas excluding towns)

Total population at risk = 220,413

	Total attacks each month	Total deaths each month	Number of inoculations each month	INOCULATED PERSONS		UNINOCULATED PERSONS	
				Attacks	Deaths	Attacks	Deaths
November	103	92	11,923	2	..	101	92
December	131	124	12,940	1	1	130	123
January	146	134	9,807	2	1	144	133
February	54	45	8,468	1	1	53	44
March	30	22	3,383	..	..	30	22
April	63	58	3,909	..	..	63	58
May	23	22	4,387	1	1	22	21
TOTAL ..	550	497	54,817	7	4	543	493

Bassein district (rural areas excluding towns)

Total population at risk = 62,004

	Total attacks each month	Total deaths each month	Number of inoculations each month	INOCULATED PERSONS		UNINOCULATED PERSONS	
				Attacks	Deaths	Attacks	Deaths
November	27	25	746	..	..	27	25
December	34	30	3,681	..	..	34	30
January	119	104	10,591	..	..	119	104
February	52	50	12,600	1	1	51	49
March	12	11	2,542	..	..	12	11
April	8	8	77	..	..	8	8
May	6	6	nil	..	..	6	6
TOTAL ..	258	234	30,237	1	1	257	233

Pyapon district (rural areas excluding towns)

Total population at risk = 121,266

	Total attacks each month	Total deaths each month	Number of inoculations each month	INOCULATED PERSONS		UNINOCULATED PERSONS	
				Attacks	Deaths	Attacks	Deaths
November	78	72	5,727	1	1	77	71
December	172	160	13,466	..	..	172	160
January	95	83	7,893	..	..	95	83
February	43	38	4,436	..	..	43	38
March	186	162	21,083	3	3	183	159
April	188	132	14,174	2	1	186	131
May	28	19	2,534	..	..	28	19
TOTAL ..	790	666	69,313	6	5	784	661

Maubin district (rural areas excluding towns)

Total population at risk = 143,218

		Total attacks each month	Total deaths each month	Number of inoculations each month	INOCULATED PERSONS		UNINOCULATED PERSONS	
					Attacks	Deaths	Attacks	Deaths
November ..	..	2	2	3	..	..	2	2
December ..	..	15	14	..	..	..	15	14
January ..	..	94	65	3,872	..	..	94	65
February ..	..	126	116	3,582	..	..	126	116
March ..	..	65	65	7,470	..	..	65	65
April ..	..	99	90	12,461	..	..	99	90
May ..	..	37	33	5,281	..	..	37	33
TOTAL ..	..	438	385	37,669	..	..	438	385

The epidemic staff worked hard and allowed only a short interval to elapse from receiving a report of a case in the rural areas and arriving on the spot to carry out general sanitary measures and inoculation. These measures were directed, in the first instance, against the case contacts and the infected houses. Their efficacy may be judged qualitatively from the fact that the figures for the recrudescence of the disease in villages and village tracts were invariably small.

The following table gives details of the attacks reported among the inoculated in the districts in question. The number of such detailed cases was not large enough to attempt drawing conclusions statistically:—

inoculation. It is difficult to avoid the conclusion that in these cases inoculation did not produce immunity.

Cases A3 and A4.—A long interval between inoculation and attack and the fatal issue suggests that if immunity had existed it had disappeared.

Case A5.—This patient recovered, but this possibly should not be attributed to inoculation only 4 days before onset.

Case B1.—Similar to case A1 and the same remarks apply.

Case B2.—This was a very old lady, stated to be over 80 years.

Cases B3, B4 and B7 followed the expected course; that is to say, they were inoculated in time for protection to develop and when attacked they recovered.

Cases B5 and B6 were contacts of a fatal case and it would appear that there was no time for protection to develop before the disease appeared.

Case C1 is similar to cases A1 and B1, and the same remarks apply.

Details of attacks among the population inoculated and at risk in (A) Pyapon district (rural area), (B) Myaungmya district (rural area), and (C) Bassein district (rural area)

Township	Sex	Attacked on	Inoculated on	Interval between inoculation and attack	RESULT
A1. Kyaiklat ..	M.	1-12-34	30-11-34	24 hours	Died.
A2. Bogale ..	F.	23-3-35	24-2-35	27 days	"
A3. " ..	F.	28-3-35	10-1-35	77 "	"
A4. " ..	F.	30-3-35	10-1-35	79 "	"
A5. " ..	F.	2-4-35	29-3-35	4 "	"
A6. " ..	M.	18-4-35	29-3-35	20 "	Recovered.
B1. Moulmeingyun ..	M.	30-12-34	29-12-34	24 hours	Died.
B2. " ..	F.	25-2-35	22-12-34	65 days	"
B3. Myaungmya ..	M.	19-11-34	14-11-34	5 "	"
B4. " ..	M.	26-11-34	20-11-34	6 "	Recovered.
B5. " ..	F.	21-1-35	20-1-35	24 hours	Died."
B6. " ..	M.	22-5-35	22-5-35	12 "	"
B7. Einme ..	F.	5-1-35	26-11-34	40 days	Recovered.
C1. Ngathainggyaung ..	F.	5-2-35	6-2-35	24 hours	Died.

Comments on above cases

Case A1.—It would appear that this man was incubating the disease when inoculated and cholera developed before protection.

Cases A2 and A6.—These were attacked within a month of inoculation and later than one week after

Subject to limitations mentioned later regarding the homogeneity of the material, the following tables are presented as a statistical test of the association of inoculation with exemption from attack. Several such tables

were compiled and analysed for separate towns and districts in different months, and in all

Rural area, Myaungmya

January 1935

	Attacked	Not attacked	Total
Inoculated at risk.	2 (16.48)	24,860 (24,845.52)	24,862
Not inoculated at risk.	144 (129.52)	195,191 (195,205.48)	195,335
TOTAL ..	146	220,051	220,197

$$\chi^2 = 14.36. \quad P = 0.00015.$$

Rural area, Bassein

February 1935

	Attacked	Not attacked	Total
Inoculated at risk.	1 (12.63)	15,017 (15,005.37)	15,018
Not inoculated at risk.	51 (39.37)	46,776 (46,787.63)	46,827
TOTAL ..	52	61,793	61,845

$$\chi^2 = 14.15. \quad P = 0.000173.$$

Rural area, Pyapon

March 1935

	Attacked	Not attacked	Total
Inoculated at risk.	3 (48.48)	31,518 (31,472.52)	31,521
Not inoculated at risk.	183 (137.52)	89,209 (89,254.48)	89,392
TOTAL ..	186	120,727	120,913

$$\chi^2 = 57.81. \quad P \text{ less than } 10^{-7}.$$

Rural area, Maubin

April 1935

	Attacked	Not attacked	Total
Inoculated at risk.	0 (13.80)	19,927 (19,913.20)	19,927
Not inoculated at risk.	99 (85.20)	122,930 (122,943.80)	123,029
TOTAL ..	99	142,857	142,956

$$\chi^2 = 16.05. \quad P \text{ less than } 10^{-4}.$$

cases where the tests could be validly applied, similar results to those above were obtained*.

The figures in brackets denote the frequencies to be expected on the hypothesis that inoculation and exemption from attack are independent. The other figures represent the observed frequencies. The application of the χ^2 test shows that in no table where the expected frequencies are sufficiently large can inoculation be said not to be positively associated with exemption from attack; in other words, the observed differences between the actual frequencies and those expected on the hypothesis of independence are too large to be considered as having arisen by chance. The sense of the association is obvious from the tables and there seems to be a strong case in favour of inoculation with this particular vaccine as a prophylactic measure, but the methods available for testing the degree of the association in fourfold tables such as the above involve assumptions which, we think, prejudice their usefulness.

The measure of the discrepancy between observation and hypothesis is, if anything, an under-estimation of the actual position. The number of uninoculated at risk is probably over-estimated whereas the number of inoculated at risk in any particular month is somewhat under-estimated. This arises as follows. The number of inoculated given in the tables represents those already inoculated on the first of the month. Persons inoculated during that month have been credited to the uninoculated, whereas attacks among those inoculated during the current month have been credited as attacks among those inoculated up to the first of the month. This procedure tends to increase the attack rate among the inoculated and to decrease that among the uninoculated. Some such precaution is necessary to ensure that the inoculated and uninoculated have been exposed to risk for the same length of time. It may be repeated that the inoculation programme was such that those inoculated were undoubtedly exposed to risk, whereas the figures for the uninoculated include a considerable number of persons whose risk was possibly not so great.

It must be pointed out, however, that before a reliable estimate can be made of the degree of protection afforded, by a measure such as preventive inoculation, it is necessary that fuller particulars of the population at risk

(Continued at foot of opposite page)

*The case mortality rates as deduced from the incidence tables given earlier are in many cases very high. This may be due to the difficulty of treating cases in rural areas or to the possibility that some mild cases which recover are not reported. Since all deaths are recorded, association tables were also constructed using 'deaths from cholera' instead of 'attacks' and a significant association similar to that displayed in the above fourfold tables was found.

THE CLINICAL VALUE OF INTRAMUSCULAR QUININE IN FEVER DURING THE PUERPERIUM IN TROPICAL AND SUBTROPICAL COUNTRIES

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In tropical and subtropical countries, fever during the puerperium is a common and constant source of anxiety to the medical attendant.

Analysis of a series of Indian labour cases during 1934 showed a total morbidity rate of 25 per cent, of which 12 per cent was classed as infective.

From the clinical point of view, the causes of fever may be divided into (1) due to pyogenic organisms, and (2) other causes. In the latter class, we have a considerable number of tropical diseases to consider, often making diagnosis a matter of difficulty.

The chronic malarial patient is extremely common in India, and our experience is that the

(Continued from previous page)

should be available so that the homogeneity of the material may be investigated.

We would strongly urge uniformity of practice in this respect by all public health departments so that different sets of data may be comparable, and also to refute charges of unreliability such as have often been made against the inoculation statistics of India. It is considered that the labour involved in maintaining such records need not be excessive. The numbers at risk and the number of inoculations in named towns and villages should be given and particulars of each individual attacked should include age, sex, race, social status, date of inoculation (if any), date of attack, and date of death or recovery. A form could be drawn up on these lines requiring only the insertion of a cross for most of the entries and it would be manageable by experienced public health epidemic officials even during a severe epidemic. The data provided by such returns would be extremely valuable for further investigations on the efficacy of inoculation, the possibility of increased resistance following inoculation even if attacked, the incidence of the disease in various age and race groups, and so forth.

In conclusion, we would refer to the fact that mass inoculation should be conducted without waiting for the arrival of the epidemic. The cholera season in many districts occurs regularly enough for this to be attempted. Such a procedure might prevent the epidemic, but at worst it would provide data for a better controlled efficacy test than when the vast majority of inoculations are conducted during the epidemic.

commonest single cause of fever in the puerperium is of malarial origin.

The diagnosis of malaria is frequently far from easy. The temperature is often atypical and blood examination is, in many cases, negative. We now define a case as malarial in which all other examinations, being negative, the temperature and pulse return to, and remain, normal, following two intramuscular injections of quinine on two successive days.

Owing to the frequent atypical nature of malarial attacks, it has often happened that accurate diagnosis has been delayed, and in certain cases rendered impossible. The rise of temperature often occurs on the second, third or fourth day, and simulates that due to pyogenic infection.

We have learned to treat malaria with respect, and consider that in puerperal pyrexia it should be definitely eliminated as a cause, as soon as possible.

In puerperal pyrexia it is common practice to administer quinine orally. Practically every case admitted to hospital has been so treated. Over and over again it has been demonstrated that many of the above cases immediately respond to intramuscular quinine, also that in cases developing pyrexia in hospital, oral quinine is slow in action, in certain cases produces no result, and invariably produces unpleasant symptoms such as tinnitus and headache (see case 1).

We consider it necessary that a method of elimination should be used that is rapid and certain in action, and have consequently practically abandoned the use of oral quinine, and for the past four years have used the intramuscular route.

Every case of pyrexia is given two intramuscular injections of quinine, gr. x, on two successive days. The first injection is given on the first or second day of the fever.

A downward swing of temperature and pulse following the first injection is an indication that the cause is malaria. A fall to normal after the second injection is accepted as definite proof.

In any other disease—except malaria—the temperature may temporarily fall, but the pulse rarely does. This is particularly true in cases of septic origin (see case 4).

The advantages claimed by this method are:—

- (1) Malaria as a cause of pyrexia is eliminated within 48 hours.
- (2) As only a small quantity of quinine is used, the unpleasant symptoms of tinnitus and headache are absent.
- (3) The slight amount of inconvenience given to the patient.
- (4) The certainty that the drug has been administered.
- (5) Considerable saving of quinine.

The chief arguments against intramuscular quinine are:—

(1) Abscesses at the site of injection are liable to occur.

I consider that abscesses are a result of subcutaneous and *not* intramuscular injection. Quinine in the subcutaneous tissue produces an indurated tender mass due to fat necrosis which predisposes to infection. Although the fear of abscesses is widespread, our four years' continuous clinical experience, during which the number of injections must be counted in thousands, forces us to the conclusion that abscesses as a result of *intramuscular* injections are extremely rare.

At the above-mentioned hospital, the sisters and staff nurses have been trained to give the injections, and do so as routine treatment.

On the few occasions on which an abscess has formed, it has always originated and formed in the subcutaneous tissue and never in the muscle, and we have attributed the cause to bad technique.

(2) Pain at the site of injection. If given subcutaneously, induration and pain will

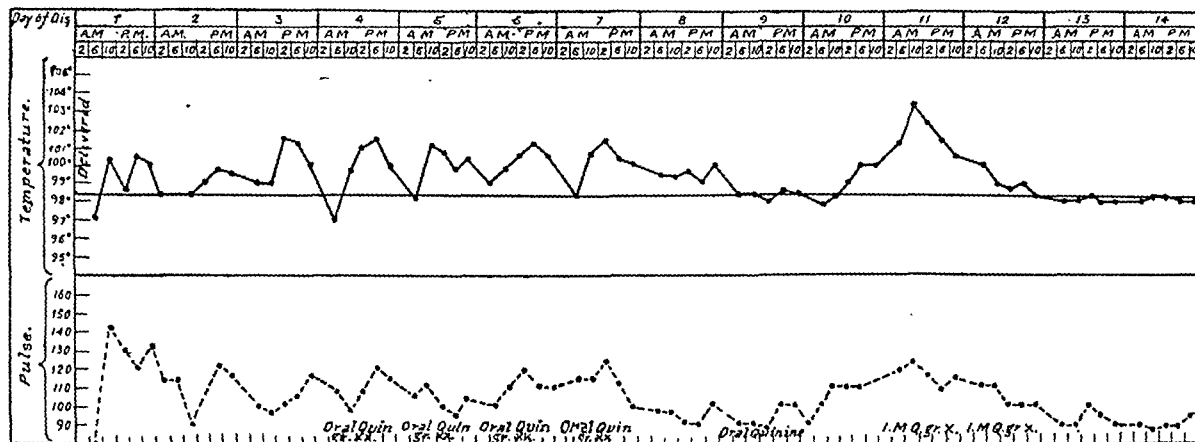
(c) If pain or an abscess results, nursing is easier than if the injection had been given into the gluteus maximus.

(3) The patient lies on her back with the leg straight. The great trochanter is identified, and a point, one hand's breadth below and opposite the external surface of the femur, is identified and painted with iodine. The needle with syringe held firmly, pen fashion, and at right angles to the femur, is smartly jabbed through the skin at the iodined area. It is then pushed towards the femur. As the fascia lata is penetrated, a slight click will be appreciated. It is important to appreciate when the fascia lata is penetrated, and to note that in some cases, before reaching it, there are about two inches of subcutaneous tissue to penetrate. I, personally, touch the femur with the needle point and then withdraw about one inch. The injection should then be given *very slowly*, practically drop by drop. Sudden injection causes distension and pain. When half the injection has been given, the needle should be withdrawn half an inch, and the injection completed. Iodine is again applied.

Date...1936.

30 E.

CASE 1



result. If given intramuscularly and followed by deep massage, the pain is very slight, and as the patient will be confined to bed for at least five days following, it will have completely disappeared by the time she leaves her bed.

Technique of administration

(1) Quinine bihydrochloride, gr. x, is boiled in 5 c.cm. of distilled water and allowed to cool. A 5-c.cm. syringe, fitted with an intramuscular needle, is filled with the solution.

N.B.—The syringe and needle should be sterilized by boiling.

(2) The injection is given into the vastus externus, and not the gluteus maximus, for three reasons:—

(a) It is readily absorbed.

(b) The patient can lie on her back in comfort and can move herself and be moved with ease.

(4) A wad of cotton-wool is then placed over the injection site and deep massage is applied for 2 to 3 minutes.

Examples

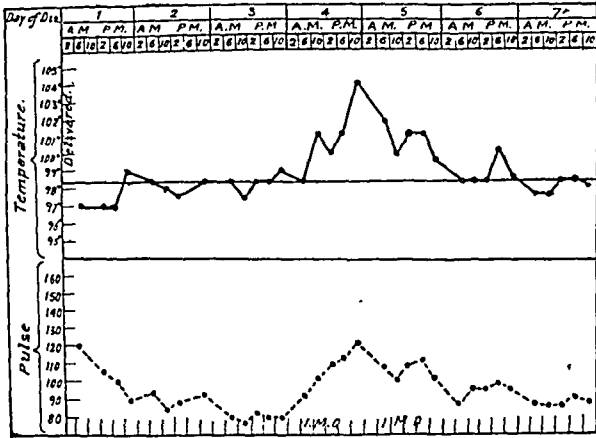
The charts of four labour cases are shown. The initial rise of temperature in 2, 3 and 4 simulates that of sepsis. In each case, complete examinations of blood, urine, genital tract and all the systems failed to show any cause for the temperature. Blood examinations for malarial parasites were negative.

Case 1 was treated by oral quinine with a slow fall of temperature on the fifth day of treatment, followed by a rise to 103.4°F. on the eleventh day, which responded at once to intramuscular quinine. The temperature remained normal after the thirteenth day. One hundred grains of quinine were given orally, as compared with the twenty grains by routine injection.

Case 2 shows a rise of temperature of 101° to 104°F. on the fourth day, strongly suggestive of infection by pyogenic organisms—immediate response to intramuscular quinine.

CASE 2

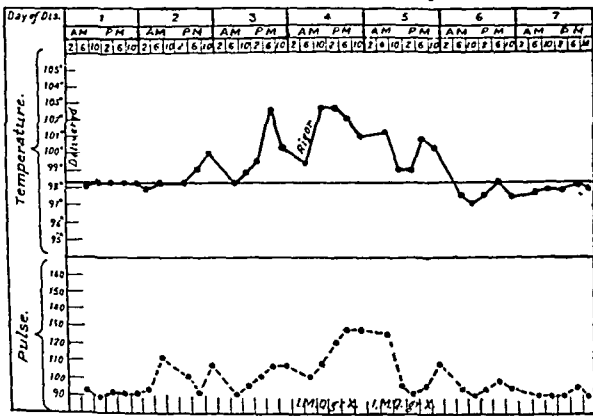
Date....1935. 229.



Case 3 is similar to case 2, and shows the downward swing of temperature and pulse following the first injection. These cases clearly show the rapidity with which malaria can be eliminated by intramuscular quinine.

CASE 3

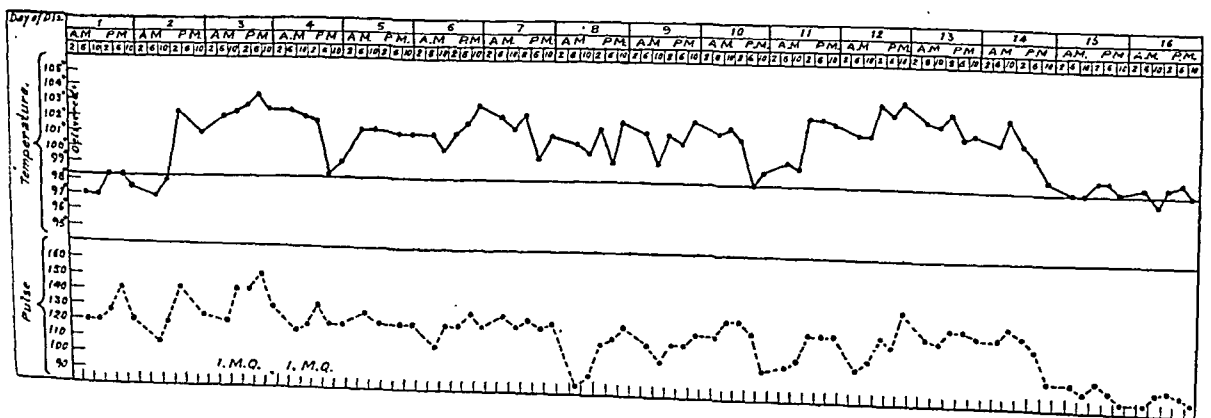
Date....1936. Name....Mrs. S. Age 22.



Case 4, in contrast, shows an infection of pyogenic organisms (uterine abscess—staphylococcal). Two intramuscular injections on

(Continued at foot of next column)

CASE 4



REGIONAL VARIATIONS OF LEPROSY WITH SPECIAL REFERENCE TO TUBERCULOID LEPROSY IN INDIA

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Introduction

To some extent the present note is a preliminary statement of certain personal observations on leprosy as it occurs in India. First and last, a great deal has been written on the subject, but not everything said has seemed capable of correlation with what is seen in some other regions. It has long been evident that, on the whole, there must be certain decided peculiarities in the general picture of the disease as it is seen in India, or at least in Calcutta, as compared with that which it presents in the Philippines. It has recently been my privilege to spend some four months in that region for the

(Continued from previous column)

the third and fourth days produced a temporary swing of temperature. The pulse remained at 120. Intra-uterine treatment was given for four days, and temperature and pulse returned to normal on the fifteenth day, following a profuse discharge of pus.

Note.—Intramuscular atebtrin has recently been used with good results. Sufficient practical experience has not yet been gained for the purpose of giving a definite opinion as to its superiority to quinine. For our purpose, oral atebtrin or plasmoquine has no advantage over oral quinine.

Summary

(1) The use of intramuscular quinine is advocated in cases of puerperal pyrexia for the purpose of eliminating malaria as a cause.

(2) The technique of administration is described.

(3) Charts are shown illustrating the rapidity of action of intramuscular quinine in malaria and its ineffective result in a case of pyogenic infection.

purpose of gaining personal acquaintance of the matter*.

Regional variations

There is ample evidence that leprosy presents more or less distinct variations in different regions. In general, this implies differences among racially different peoples, but it is as yet an open question whether the variations are ascribable to the racial factor or to climatic and other geographic conditions. Muir (1934) believes that climate is chiefly responsible, and Hayashi (1935) is inclined to the same view. On the other hand, Cochrane (1935) observed distinct differences between people from India and the Negroes living under the same conditions in the West Indies, and Ryrie (personal communication) says that there are differences in the three racial groups (Indian, Chinese and Malay) in Malaya. It would seem that here again, as in so many things with regard to leprosy, one must take a middle road; very likely both climatic and racial factors are involved.

Without entering into the general question of regional variations of disease, it may be of interest to note a recent article that touches on the matter with reference to malaria in India. Wilson and Wilson (1936) state that the epidemic type of that disease is characteristic of the Indo-Gangetic plain, while in Assam, parts of South India and elsewhere 'malaria may have very different characters'. They ascribe this, first, to climatic conditions, and secondly to racial factors, laying considerable stress on the latter. They also quote Schüffner concerning differences of malaria in the Bantus of Africa and the Malays.

With regard to the nature of the variations in leprosy, these have a considerable range. Variations, sometimes fairly marked, in features, such as age incidence and sex ratio (differences in numerical proportions, which here will be called *relative*), are taken more or less as a matter of course. But it is not so generally recognized that in certain features there are variations so great, peculiarities so limited in distribution, as to approach *absolute* differences.

It is not intended to say that there is any feature of the disease which is necessarily confined entirely to one region, so the term 'absolute' is used in a qualified sense. After all, leprosy everywhere is fundamentally the

same disease, caused by the same micro-organism operating in the human body, and it is entirely likely that any feature of it whatever may be seen sooner or later in any country. However, it is meant to say that a condition which may occur frequently in one place (and, consequently, may be taken by observers there to be common to the picture of the disease generally) may be very exceptional or actually non-existent in another place. In consequence of this any two students of the disease may well write descriptions of leprosy which in some respects would appear to be irreconcilable. Despite arguments that the regional variations are more apparent than real, they are coming more and more to be recognized by individuals who have had opportunities to observe them personally.

An incident to illustrate this: one day, in 1930, Lowe and I were walking together about the neat little Siamese Red Cross asylum some distance downriver from Bangkok. For a time Lowe was silent, absorbed in what he was seeing. My own attention was attracted mostly to the general features of the institution and the evidence of cultural peculiarities of the inmates, for as cases of leprosy there was nothing unusual evident among them. Finally, Lowe broke his silence: 'Is *this* leprosy as you see it in the Philippines?' The reply being in the affirmative: 'Well, it is certainly different from what we see in India'.

'Relative' variations

Leaving aside features as unsatisfactory to deal with as age incidence and the sex ratio, we may consider one or two of the 'relative' variations that are referable to the severity of the disease in the individuals affected.

Proportions of types.—First of importance, though not most susceptible of satisfactory demonstration, is the question of proportions of the types of the disease. It is agreed by many that the relatively benign neural type is proportionately more common in some countries than in others. It may be objected that this statement cannot be substantiated until all existing cases in the regions to be compared are known and classified, because the incipient and abortive cases, which ordinarily are not recognized, may alter the picture. However, with full appreciation of the importance of those cases, I should say that this objection would confuse the immediate issue. Slight abortive cases are not going to progress to the well-established stage; and incipient cases (if they do not become abortive) will develop into one or the other type by the time they become sufficiently well-established to be recognized by the regular medical establishments. If we limit our comparison to cases that have become sufficiently well-established to be so recognized, I think that it must be admitted that the type ratios are not the same in all countries.

* For the opportunities that have been enjoyed an expression of appreciation is due especially to Drs. Robert G. Cochrane and Paul Raj, of the Lady Willingdon Leper Settlement, Chingleput, Madras; to Drs. John Lowe and S. N. Chatterji, of the Leprosy Research Department of the School of Tropical Medicine in Calcutta; to Dr. Whittaker at Purulia, Bihar; to Dr. R. Briercliffe, Director of Medical and Sanitary Services, and Drs. D. S. de Simon and A. C. Fernandez, Leprosy Survey Officers, in Ceylon; and to others in those places who are in authority or have co-operated.

We (Wade and Rodriguez, 1927) in the Philippines have long been of the opinion that there is a higher proportion of the malignant, cutaneous type of the disease there than is the rule in China, though perhaps not as high as in Japan. On visiting Indo-China one gets at least the impression that there are relatively more neural type cases in the hill region than in the lowlands. Muir (1934) has stated that differences in type proportions can be seen in 'the cold elevated valleys of Cashmere, the hot dry plains of the Punjab, the moist valleys of South India, and the comparatively dry plateau of the Deccan'.

We have always understood that there are proportionately fewer neural cases in the Philippines than in India. Santra (1934), after a visit to the Philippines, wrote: 'Essentially I find no difference in the types of leprosy, as I have seen them in both countries'. But much of his article is given to a qualitative rather than quantitative discussion, to a consideration of the early lesions rather than to the point of our present discussion, the picture of the well-established disease as expressed in the proportion of types. He says that at the School of Tropical Medicine in Calcutta, out of 1,392 cases diagnosed in 1932 as leprosy, 65.4 per cent were neural. I have recently had the privilege of sitting in that clinic during several sessions, and out of 99 consecutive new cases only 18 were cutaneous. It is to be remembered that these are mostly cases detected by others and referred for diagnosis. For nearly six years (1916 to 1922) I was a member of the official committee in Manila whose work, similarly, was the diagnosis of referred cases, and can assert that much less than a majority of the cases seen by that committee were neural.

Involvement of the eye.—Certain features of leprosy, referring especially to differences in the severity of lesions of the cutaneous type, are more open to direct observation than the type proportion. To one at all familiar with the appearance of the average patient in leprosia in India or the Philippines—even those institutions that are simple asylums for the most needy—the ravages of the disease seen in Japan are apt to be a little startling. This condition is well illustrated by the frequency of leprotic eye involvement and of its progression to the stage of blindness.

Hayashi (1935), who made a prolonged tour of leprosy institutions in 1934, inquired into this feature to some extent. Among his figures are the following:—

Culion, P. I.—6,500 inmates, 1.0 per cent blind.

Sungei Buloh, F. M. S.—1,200 inmates, 1.0 per cent blind.

Hendala, Ceylon—600 inmates, 1.7 per cent blind.

Purulia, India—700 inmates, 2.9 per cent blind.

Carville, U. S. A.—350 inmates, 8.6 per cent blind.

Zensei, Japan—1,100 inmates, 18.2 per cent blind.

Hayashi speculated that the remarkably high figures for Zensei may be due to the long average duration of life (17 years) of the inmates of the Japanese leprosaria, but this can hardly be the whole story. At Culion, for example, there are many inmates who have had the disease as long as the average in Japan, but even among them the proportion of blind does not approach that at Zensei. On the other hand, the Zensei figure is in keeping with other features of leprosy seen in that country.

'Absolute' variations

Another and more peculiar feature of leprosy in Japan, one which is an 'absolute' difference in the present sense of the term, is leprous alopecia. This refers to loss of hair due to lepromatous infiltration of the scalp, a condition that some books say does not occur at all. On this point, too, Hayashi made inquiry. Selected figures from his table work out as follows:—

Philippines, several thousand patients seen, no case seen.

Malaya—1,200 patients, 0.8 cases per thousand.

Java—320 patients, 34 cases per thousand.

South Africa—860 patients, 7 cases per thousand.

United States—350 patients, 1.4 cases per thousand.

Japan (in some institutions) more than 50 per cent.

It is not at all certain from Hayashi's report whether all of the cases noted had been proven to be leprous alopecia, but there is no doubt whatever that this condition does occur in other places than Japan. I have seen and photographed a few typical cases in China and Africa, and Cochrane has recently seen an excellent example (in an African Negro) in the West Indies.

I do not know of any record of the condition from India. Hayashi does not even mention India in his report, and at Purulia I was told that there was no bald person among the 750 inmates. The same was the case at Chingleput, though there was one man with very extensive and marked leprotic involvement of the scalp, with general thinning of the hair but no actual denudation. In the Philippines I have never seen or heard of a case, though I have seen a few cases in which there was some degree of leprotic involvement of the hairy scalp, as Santra did, but they were without alopecia. In South Africa the scalp is involved in many of the cases with skin lesions of a certain kind (minor tuberculoid, *vide infra*), but it is usually necessary to remove the hair to find them. It may be granted that slight-degree involvement of the scalp is not uncommon, for this is one of

the areas to which attention is seldom attracted. That such neglected areas may be involved has been shown by Lowe (1933), and Manalang (1933-35) has found frequent affection of the clinically normal palmar surfaces of the left hand and right hand, and of plantar surfaces of the left foot and right foot, and also of the posterior, inferior, auricular and the inguinal areas. However, if we consider the matter of scalp leprosy from the view-point of frequency and degree, Japan stands alone. In that country this condition affects both men and women, and even denudes the scalps of boys of 12 to 14.

Manalang negatives the significance of this peculiarity by ascribing it to the Japanese practice of shaving the heads of infant boys. But that does not explain its occurrence in females. Nor does it agree with its infrequency in China, where head-shaving of children is also a common custom, nor its absence in India, where the Mohammedans shave the heads of their boys. Hayashi's idea of the influence of the climate seems more logical, but it is not entirely satisfactory. Central China, where cases are uncommon, and Norway, where they are unknown, also have cold seasons; while Netherlands, India, Central Africa and the West Indies are never cold.

Cold abscess of the nerve.—In this condition we have another outstanding regional peculiarity. Muir (1924) reported briefly on a single case of it, and Lowe (1929 and 1934) has gone more fully into the matter. Previously nerve abscess had been recognized as a clinical feature of leprosy, though Klingmüller (1930) has dug up a few cases from the literature. It remained practically an exclusive peculiarity of leprosy in India until within a year, when Schujman (1935) reported cases from Argentina and deSouza Campos (1936) from Brazil. It still stands among 'absolute' regional differences of leprosy because it is seen in so few places.

In the Philippines I have never seen anything like it, either clinical or among the hundreds of autopsies done at Culion in which superficial and deeper nerve trunks have been examined. However, Lara recalls one patient with marked swelling and fluctuation of both great auricular nerves which was very possibly of this nature, though it was not investigated. The first case that I ever saw was at Dichpali, in 1931, when Lowe kindly demonstrated several of them, aspirated one abscess for smear examination (which was negative for bacilli), and removed one for histological examination. That specimen I (1934) found to be tuberculoid—i.e., of the structure familiar in tuberculosis but by no means specific of or confined to that infection. The same essential structure was found by deSouza Campos in his Brazilian cases.

It must be interpolated here, to qualify and clarify the statement made above, that in the Philippines there do rarely occur inflammatory

conditions of the nerve that more or less approach abscess formation. But all such lesions that I have seen have been of entirely different nature, clinically and pathologically, from the cold abscess of India. Santra, in his effort to show that leprosy in the Philippines and India is similar, speaks vaguely of nerve abscess in the former place but only serves to obscure the question. The Philippine cases here referred to were of relatively acute nature, without caseous necrosis, and occurred in advanced cutaneous-type cases, whereas the cold abscess is preceded by caseation and is confined to the neural type. We would not expect to see it at Culion, where practically all cases are cutaneous (or were when they were sent there), which makes uncertain the nature of the condition that Lara saw. Though neural cases are not segregated in the Philippines, many of them are known and seen in the clinics, and the occurrence of nerve abscess would certainly come to attention there sooner or later. Philippine experience in this matter is in line with that in Ceylon, rather than that in India.

OTHER PECULIARITIES OF LEPROSY IN INDIA

Diffuse cutaneous leprosy

Discussion of nerve abscess brings up the broad and as yet tangled question of 'tuberculoid leprosy', to study which in comparison with phases of it seen in other countries was the primary object of my recent visit to India. However, there is another phase of leprosy in that country that is striking to an outsider, and in discussing the peculiarities of the disease there it should be mentioned.

This refers to that form of the cutaneous type of the disease in which bacilli can be obtained from almost any part of the body-surface, though there may be no definite infiltration to lead one to suspect their presence. To one accustomed to working with lighter-skinned people, in whom one expects to find at least definite erythema if not frank infiltration in areas from which bacilli can be found, it is somewhat bewildering to be shown many cases that have widespread leprotic involvement but little or no suggestion of infiltration of much of the involved surfaces (especially of the trunk)—only a peculiar indefinite mottling, perhaps due to slight erythema under the pigment but not definitely pathognomonic, and at most a slight shininess. Muir ascribes this to (a) a lack of general resistance to the infection that permits the bacillus to multiply generally throughout the skin, and (b) to lack of local response to its presence that results in failure to produce infiltrations and nodules. Apparently no detailed comparative study has yet been made of the pathology of these cases and of the more ordinary ones, but material has been collected for such a study.

Tuberculoid leprosy

To return to 'tuberculoid leprosy', it would be well before going farther to indicate briefly and informally what that term implies. Usually—and properly, I venture to say—the term is applied to certain infiltrated lesion which can be distinguished clinically from the lepromatous skin changes (infiltrations and nodules) of cutaneous-type leprosy on the one hand, and from the comparatively simple, flat macules (leprides) of ordinary neural-type leprosy on the other hand. The distinction is based on (a) the degree and outward character of the infiltration; (b) the centrifugal progression of the lesion, their typically abrupt demarkation from the uninvaded skin, and their tendency to heal in the older, central portions; and (c) the fact that they are typically negative on standard bacteriological examination. When, as is occasionally the case, they are positive the bacilli are, with rare exceptions, rather scarce. Also to be taken into consideration are other, more general, clinical features of the cases as a whole which indicate that they are not of the malignant cutaneous type.

Of these frank, clinically-recognizable tuberculoid leprides, I have become convinced that we should recognize, chiefly but not entirely for clinical distinction, two main divisions. These may be called the 'minor' and 'major' varieties. The *minor* lesions are characterized by a moderate degree of infiltration, which is essentially superficial; in consequence of its location it produces more or less irregularity of the surface (micropapulation or 'pebbling'). In the *major* variety, which is the more striking, the infiltration is relatively marked and typically involves the deeper layers of the skin to a much greater extent than does the minor one. In consequence, those who are unaware may easily confuse it with lepromatous (cutaneous type) infiltrations and nodulations.

It is major variety tuberculoid lesion that is particularly interesting in Calcutta. From the literature it has long been evident that it is very common there, though in the past it has not been clearly differentiated from other classes of lesions. It has also been made clear (Muir and Chatterji, 1933) that the cutaneous nerves are especially affected in this condition, at least in Calcutta; this is not so evident from reports on the condition from other countries. I have seen such nerve enlargement in China, but rarely in the Philippines—but then the major condition is not common there. Most of our clinically tuberculoid cases are of the minor variety, a distinction which had not been made when Santra made the observations which he relates.

At the leprosy research centre in Calcutta I was given the opportunity to see many cases of the major variety, and to secure an abundance of material for histological study. Numerous patients on the lists of cases under treatment

or observation were called up for demonstration. Since these were selected cases, it was especially interesting to note the frequency of this condition in the unselected cases that came to the clinic for diagnosis. Out of 99 patients seen in this way not less than 27, and perhaps more, were of this variety. Lowe, having had several years' experience in the Deccan, recognizes the special prevalence of this condition in Calcutta, and the peculiar features that it presents. Some of his colleagues from other parts of the country call it 'Calcutta leprosy'.

Some of the new cases were of relatively acute 'reaction' nature, informally distinguished by Lowe as 'N. ? C.' Because of the general appearance of the markedly infiltrated red lesions, these cases might be classed as cutaneous by almost any one, especially when (as sometimes happened) bacilli were found in smears. There can be no question but that such cases are so classified where more emphasis is placed on the bacteriological findings than on the entire clinical picture of the case.

It may be well to point out here that it is not only in the regions that have been mentioned that variations in tuberculoid leprosy have been noted. Tisseuil (1936) in a very recent article says that there are great differences between the 150 cases that he saw in New Caledonia and the 77 seen in French Guiana. In Caledonia he saw little but 'primary tuberculoids', and those chiefly in adults; in Guiana the forms are very varied and, though they are found in all ages, they occur chiefly in children, so that he has even come to think that leprosy may sometimes commence with this form of lesion. In Caledonia the form seemed quite fixed; in Guiana, to the contrary, the varied forms are, he thinks, intimately allied to the evolution of the disease.

Largely to get an idea as to whether the major tuberculoid form is generally common in Northern India, or whether it is peculiarly prevalent in the Calcutta area, Lowe and I went to Purulia. This is in a rural area, but as Lowe pointed out it also differs from Calcutta, which is humid and in alluvial country, in that it is higher, dry, and on hard upland soil; furthermore the people differ racially. In a three-day visit we inspected, rapidly but in some detail, a large number of cases. Among 153 'run-of-the-mill' outpatients, there were 17 cases (11 per cent) that we diagnosed as definitely or probably major tuberculoid. There can be little doubt that the proportion of such cases in that region is considerably lower than among the patients coming to the Calcutta clinic for diagnosis.

Chiefly in order to make a comparison, I spent more time at the Lady Willingdon Settlement in Madras, South India, than in Calcutta. Only a few major tuberculoid cases were found in that institution, though there are many neural cases there and though the great majority

of the 700 inmates were examined. This is not to say that this variety of lesion is really rare in that region, for when it was particularly looked for several cases were recognized, some by Cochrane among outpatients in Madras City, and others among patients presenting themselves at the settlement. However, it is to be remembered that these cases are more striking and often seem more in need of institutional treatment than those with the ordinary flat macules, so taking all factors into consideration it seems quite certain that the incidence of this variety of case is much lower in the region of Madras than in North India. Lowe has said the same with respect to the Deccan.

In Ceylon, where an opportunity to see many patients and secure much material occurred, the situation is on the whole very much like that in Madras. At the outset the leprosy survey officers stated that they do not see in Ceylon anything like the amount of marked cutaneous nerve involvement that they had seen when under training in Calcutta, and this is undoubtedly true. At the Hendala asylum, where there are some 700 inmates of both types hospitalized under a nonselective segregation law, we found only a very few major tuberculoid cases, none with very much enlargement of cutaneous nerves. One major case was found among nearly 100 outpatients examined; this one had two large nerves leading up from the single lesion on the arm.

In the foregoing discussion nothing is said of the interesting and important question of the relation of tuberculoid leprosy to the cutaneous form of the disease, or of the occurrence of tuberculoid lesions in primarily cutaneous-type cases. This is an important subject on which there is as yet little precise information. Nor is anything said of the more immediate question of the relation between tuberculoid cases and the common variety of neural cases with simple, ordinary macules. Of this matter it can only be said here that within the past few years it has been learned that many of the apparently (*i.e.*, clinically) simple flat leprides, especially when active, show histologically tuberculoid changes of relatively slight degree. This is the case in material that I have collected in the Philippines, China, Ceylon and India. In Calcutta I learned that Lowe has arrived at the same conclusion. This may seem confusing, and it is confusing when these clinically 'simple' lesions are spoken of as 'tuberculoid' solely because of the histological findings, but in my opinion it is readily correlated with the rest of the picture. The whole question is largely one of degree. Histological tuberculoid changes range, with all degree of gradation, from (a) those that are so slight that the lesions are clinically simple to (b) the intermediate 'minor' tuberculoid lesions, with changes of moderate degree and of characteristically superficial location, and finally to (c) the gross

'major' tuberculoids, with relatively marked changes that usually extend more deeply and often tend to severe involvement of the superficial cutaneous nerves. Furthermore, the fact that the simpler lesions are tuberculoid in nature very definitely ties up clinical 'tuberculoid leprosy' with the neural type as a whole. There is a tendency on the part of some workers, who evidently are not aware of the facts just stated, to set the major cases aside as a group peculiar to itself*.

In closing this discussion I wish to express my appreciation of the Calcutta Research Centre. I believe it safe to say that there is no place in the world where more peculiar and fascinating forms of leprosy can be seen, no place more interesting in which to study the disease. Further, it is doubtful whether there is any other place where there is as much opportunity for such study, or where fuller advantage is taken of the opportunities. That centre is avowedly a research institution, not burdened by the primary responsibility of giving routine treatment to a mass of patients regardless of their kind and suitability. Large numbers of new cases (1,500 and more a year) pass through the diagnostic clinic, and among them there is an abundance of patients who are willing to submit to the procedures necessary for their study. Furthermore, there are available for special treatment as many patients as can possibly be desired, though of course this is limited to the comparatively unsatisfactory outpatient basis. But it must be said that in these very conditions there is definite danger of arriving at an unbalanced view of leprosy as a whole, and of the effects of treatment. The workers there do well to keep in intimate contact with other kinds of institutions in other parts of the country. It would, I am convinced, be profitable for all concerned if they could put into effect here, on a mutual exchange basis, one of the recommendations of the Leonard Wood Memorial Conference (Gushue-Taylor, 1931).

Transfer of workers.—It not infrequently happens that the results obtained by a worker or a group of workers in one country are not confirmed by those working in other countries. Whether this is due to peculiarities of conditions prevailing, or to the personal equation, or to other factors, it is usually not apparent. Progress toward the clarification of questions of regional differences could undoubtedly be accelerated were it possible for persons who have carried out studies in one region to be transferred to another in order to continue or repeat such studies there or to undertake correlative investigations. It is deemed desirable to bring the possibilities of such a plan to the notice of institutions and organizations concerned with the study of leprosy.*

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A Mirror of Hospital Practice

A TUMOUR IN WHICH BOTH SARCOMATOUS AND CARCINOMATOUS CHARACTERISTICS ARE PRESENT

By K. R. SITARAMA IYENGAR, B.A., L.M. & S.

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V., a female, aged 58, was admitted into the hospital on 6th July, 1936, with a tumour on the right side of her neck.

Family history.—Nothing noteworthy.

Personal history.—Married woman, widowed for about 30 years. Gave birth to two daughters; one is alive and healthy and is about 38 years of age and the other died at the age of fourteen.

History of present illness.—About 30 years ago she noticed a small hard swelling in the right side of the neck just behind the middle of the right sterno-mastoid muscle; it was very slow-growing and gave no trouble. For the last three or four months, she said, the swelling had rapidly increased in size to that of a good-sized mango and has become painful. She was able to carry on and do her household work.

Condition on admission.—A moderately well-nourished woman, rather anæmic, tongue not coated, has tartar on teeth and slight pyorrhœa alveolaris. Lungs, liver and spleen—nothing abnormal. No enlargement of glands. Deep palpation of abdomen does not reveal the presence of any enlargement of abdominal glands or tumours of the generative organs.

There is a hard nodular tumour occupying the posterior triangle of the right side of her neck giving an indefinite sensation of mobility, but at the lower

part near the clavicle the movement of the tumour is limited. There are areas of fluctuation in the tumour where the skin appears to be adherent. The right external jugular vein could be seen coursing over the upper part of the tumour but it is not visible at the lower part.

Diagnosis.—Malignant growth?

Operation notes.—The omohyoid and sternomastoid muscles spread over and were adherent to the tumour from which they had to be carefully separated and partly cut. The whole tumour with an oval portion of the skin, which was adherent, was excised. All bleeding points were tied and the wound closed. When the tumour was excised the whole of the floor of the posterior triangle of the neck was laid bare. The carotid artery could be seen pulsating.

Pathologist's report.—I sent the whole tumour to the Professor of Pathology, Medical College, Madras, who sent the following report:

'Appearances of the section taken from one part of the growth are those of a spindle-celled sarcoma in which a large number of giant cells are seen. There are also areas of hemorrhage and degeneration. Tissue taken from another part of tumour shows a similar appearance with, in addition, hyaline degeneration and areas of calcification. The peculiarity, however, is the presence of an area showing the typical appearance of a papillary cystic adenomatous growth. The tumour is thus peculiar in showing both carcinomatous and sarcomatous characters'.

Progress of the case.—Except for a small rise of temperature a couple of days after the operation and slight oozing of blood through the rubber tube left at the lower part of the operation wound, the woman did fairly well. The sutures were removed on the tenth day when there was a slight gaping of the wound which is not quite healed at the time of writing. On the suggestion of the professor of pathology, I examined her again and found no signs whatever of any ovarian tumour. She is quite certain that she never had any trouble pertaining to her generative system.

The one notable feature that I was able to gather after careful questioning was that the swelling appeared a few months after the cessation of her sexual life consequent on the death of her husband about 30 years ago.

A CASE OF PARAPLEGIA AND HYDROPHOBIA FOLLOWING A FULL COURSE OF ANTI-RABIC TREATMENT

By S. C. SEN GUPTA, D.T.M.

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A MALE tea garden coolie, aged about 30 years, was bitten on the 4th June by a dog suspected to be rabid. He was seen about half an hour later and there were two teeth marks on the lateral aspect of the right leg about its middle—the legs were bare. These two wounds were about $\frac{3}{4}$ of an inch deep, $\frac{1}{2}$ an inch apart and were bleeding. There were some abrasions of the skin in the neighbourhood.

Information regarding circumstances of the bite.—The dog was suspected to be rabid because of its unprovoked attack on this man and on a female coolie bitten on the same day. Attempts to capture the dog for detention and observation failed as the animal escaped to a neighbouring estate, where it bit three more persons on the same evening and eluded all efforts at capture, and nothing further was heard of it.

Treatment.—The wounds and abrasions were thoroughly cleaned and cauterized with pure phenol about half an hour after the bite. Two full courses of anti-rabic vaccine were at once ordered from the Pasteur Institute, Calcutta, and injections were started on the 11th June. Both the patients (male and female mentioned above) received a full course of injections strictly in accordance with the directions of the Pasteur Institute; that is to say each patient received 5 c.cm. of vaccine daily for 14 days, each dose being divided into two equal portions of 2.5 c.cm. injected on each side of the lower abdomen. The patients were kept under close observation during the 14 days' course. The male patient completed his course on 24th June, and the female two days later as she had postponed two injections on account of pain from previous ones. No untoward symptoms appeared during the vaccine course and both patients faithfully adhered to my instructions. The male patient resumed work on 29th June and remained in apparent good health until the night of the 5th of July when he had a rigor followed by fever. Blood examined the next morning showed benign tertian rigors in scanty numbers. Quinine mixture (grs. x to oz. i) was given at 9-30 a.m. At about 1-30 p.m. on the same day the patient suddenly experienced weakness of his lower limbs. I examined him at 5 p.m. and found the following condition:—

Sphincters were apparently normal. Paraplegia of the flaccid type—knee jerks and the other leg reflexes being absent. Anaesthesia and deep analgesia were present from the toes to the umbilicus, where he complained of a girdle-like sensation.

Mental condition was apparently normal.

Temperature—99°F.; pulse—90 per minute; respiration—normal; tongue coated and moist; bowels constipated for two days.

Heart and lungs—normal.

Spleen—palpable. Liver—not enlarged.

No other abnormalities could be detected in the rest of the nervous system.

The original teeth marks of the dog bite were healed and no complaint was made in connection with them.

At this stage the case was regarded as one of post-vaccinal paralytic accident. The patient was removed from the lines to the estate hospital for close observation.

Treatment given was as follows:—

Castor oil	..	..	oz. i
R Potassium iodide	..	..	grs. 3
Liquor strychnine hydrochloride	..	..	m 4
Liquor arsenicalis	..	..	m 2½
Water	..	to	oz. i

White liniment rubbed into the lower limbs twice daily.

Quinine bi-hydrochloride, grs. x, was injected intramuscularly.

Up to the 8th July the patient's condition remained about the same, the bowels moved well and the above treatment was carried on.

On the 9th July at about 7 a.m. when the patient was on the point of washing he suddenly felt a choking sensation in the throat and began to breathe hurriedly. He complained of inability to get his breath and difficulty in swallowing, and he rapidly grew worse. He became restless, noisy, and at times violent. The eyes were congested and there were tetanic convulsions of the muscles of the chest, back and hands. Salivation seemed excessive but this was probably accounted for by the difficulty in swallowing.

Mentally he was in a state of acute apprehension and fear, alternating with maniacal outbursts of violence. The symptoms of hydrophobia could easily be elicited by presentation or mention of water.

At 11-30 a.m. morphia gr. $\frac{1}{4}$ was injected but with little obvious effect. The bladder was relieved by catheter as there was now retention of urine. Later on morphia gr. $\frac{1}{4}$ was repeated as required, with hyoscine hydrobromide gr. 1/100. Little or no sedative effect resulted and he passed a sleepless noisy night. On the following morning the patient was semi-conscious, exhausted and muttering to himself. The subcutaneous tissues of the neck were swollen by surgical emphysema. Temperature 98°F., pulse 120 per minute, respiration hurried. His general condition of exhaustion contrasted markedly with the violence of the previous day. Stimulants such as digitalin were exhibited but had no effect and the patient died at 4-30 p.m.

Discussion

(1) This is a case developing paraplegia on the 12th day, and hydrophobia on the 15th day after a full course of anti-rabic vaccine.

Was this a case of post-treatment paralysis followed by hydrophobia or was it a case of rabies exhibiting initial 'dumb' symptoms progressing to the more violent type of rabies?

(2) The anti-rabic treatment in the above case neither prevented the development of nor modified the course of the disease.

(3) The dog-bite wounds were quite healed and did not exhibit any signs of irritation during the attack.

(4) The patient showed no evidence of susceptibility to anti-rabic vaccine during the course of treatment.

(5) The other (female) patient, who had the same course of treatment with the vaccine of the same batch (number 46), is quite well and working, up to date. The three patients on the neighbouring estate are also well.

(6) Can this be regarded as a case of inherent susceptibility to rabies? The answer to this question is difficult owing to the lengthy and variable incubation period of rabies.

I wish to thank Dr. J. M. Sclater, the chief medical officer, for his valuable advice and permission to publish this note.

Indian Medical Gazette

NOVEMBER

INTRAMUSCULAR QUININE

THE strength and the weakness of modern scientific medicine is displayed in the fact that any two of its practisers are capable of expressing almost totally divergent opinions without either of them earning the censure of the profession as a whole. The profession we practise is a progressive one, not governed by unalterable dogma or any supreme authority; herein lies its strength; its weakness is that we are thereby laid open to the charge of uncertainty and vacillation.

There are few subjects that have provided such acute divergence of opinion as that very simple question of which is the best method of administration of quinine. Not very long ago (October, 1934), we discussed the subject of intravenous *versus* intramuscular quinine. We did not take the extreme view, held by many prominent workers in tropical medicine, that it was unjustifiable to give quinine by the intramuscular route in any circumstance, but we expressed the opinion that 'to give quinine intramuscularly as a routine is a gross abuse'.

We discussed the points for and against intramuscular quinine in this 'editorial' and we do not propose to recapitulate them here; our main point, however, was that in 99 cases out of a hundred the oral route is as effective as the parenteral and therefore that it is quite unnecessary to submit the patient to the risk—however small this may be—of an intramuscular injection, except on very rare occasions, when the necessity for making an exception is usually clearly indicated. Quinine is rapidly absorbed from the stomach: in 15 minutes after oral administration it can be recovered from the blood in considerable quantities, and after about two hours the concentration in the blood is about the same by whatever route the quinine has been given; these are experimental facts based on investigations both on animals and on patients. There may be rare occasions when absorption from the stomach is seriously defective—just as it has been shown that occasionally the injected quinine remains locally in the muscle—but it is not with the rare occasions that we are concerned.

Despite these facts, there are clinicians who claim that they obtain more satisfactory results if they give quinine intramuscularly, not simply now and then but as a general rule; in a paper that appears in this issue, the professor of obstetrics and gynaecology at the Lahore medical college makes this claim and expresses

an opinion in this matter which is almost diametrically opposed to our own.

This paper is not a statistical analysis of the writer's total experience, but is simply a statement of the case in favour of the procedure that he has adopted; that is to say it is an expression of his opinion based on his past experience. In this paper the writer quotes four cases; we may assume that these are typical examples taken from his total experience and are quoted to demonstrate his point, which is that malaria is an important complicating factor in obstetric practice, that the ordinary methods of diagnosis of a malarial infection are not sufficiently reliable to be depended upon, that quinine by the mouth cannot be trusted to control a malarial infection, and that this control can, and should, be effected by the administration of two intramuscular injections of quinine on two successive days.

Communications in support of the practice of giving intramuscular quinine are usually, as in the present case, based on impressions gained during practical experience rather than on protozoologically- or chemically-controlled observations, the results of which have been subjected to statistical analysis. Whilst we realize that expressions of opinion such as these have a very definite value and cannot be entirely ignored, in view of the fact that there is so much experimental support for the other point of view, some attempt should be made by the supporters of the intramuscular route to place their observations on a scientific basis. Until they do, we cannot deviate from our opinion, already expressed, that the practice of giving intramuscular injections of quinine as a routine measure is a bad one.

There are two methods commonly adopted for making a diagnosis of malaria—the finding of the parasites in the peripheral blood and the therapeutic test by the administration of adequate doses of quinine. The first method is the most reliable one; the demonstration of the parasite shows that a malarial infection is present; the value of a negative finding will depend largely on the care and perseverance of the microscopist, but cannot be accepted as final, as there are cases in which the most diligent search fails to demonstrate a malarial infection that the subsequent history of the case proves to have been present. Similarly, there are occasions when adequate dosage with quinine will not bring down the fever in a case of plasmodial infection. Whilst a negative finding by either method may not be accepted as proof of the absence of malaria, a double negative finding is usually accepted as very strong evidence that the fever is due to some cause other than malarial infection.

To turn again to the paper under discussion, besides the conclusions at which the writer has arrived there are a few points that we consider are open to criticism. He has accepted too

readily the failure to find parasites in his cases. Surely obstetric cases do not present an exception to the rule, and it should be possible to find parasites in the vast majority of these, if the fever is due to malaria. Then again he seems to have attached little importance to the absence of response to adequate doses of quinine by the mouth. So that he has started with an open mind regarding diagnosis at a point where we should consider that the evidence was about 100 to 1 against malaria, and has then adopted a criterion of his own for the diagnosis of malaria, that 'all other examinations being negative, the temperature and pulse return to, and remain, normal, following two intramuscular injections of quinine on two successive days'. If he starts with this as his criterion for the diagnosis of malaria, the hundred per cent success of the measure that he recommends is of course assured, and his argument becomes irrefutable. But is he not starting from an entirely false premiss, namely, that in a case in which no parasites can be found and in which adequate (on the usually accepted standards) doses of quinine by the mouth failed to reduce the fever, the fall of the temperature and pulse to normal after the intramuscular injection of 20 grains of quinine is proof of malarial infection?

We may perhaps be presenting the case in an unfavourable light and the writer may claim that he does not depend entirely on this as the criterion, and that he also eliminates all other obvious causes of fever. But surely in a country where the causes of fever are so varied and in a condition in which the chances of the existence of a small septic focus that may be over-looked are so great, it is dangerous to make a diagnosis by a process of elimination.

Even in the absence of scientific data in support of the case for intramuscular quinine, the 'impression' that it is of special value is

firmly implanted in the minds of so many clinicians that we must not just ignore it. Can we then explain it?

After an intramuscular injection the absorption of the quinine is probably a little more complete than if the same dose were given by the mouth, but this difference is more than corrected by the larger dose that is given in oral administration.

Is it the mode of entry of the quinine to the circulation which makes the difference? From the muscles the quinine will pass through the lung capillaries before reaching the general circulation, whereas from the stomach it first passes through the liver. Much work has been done on the subsequent course taken by quinine when it enters the body by the various routes; the explanation does not appear to lie here.

Is it then possible that the intramuscular injection has some action independent of its quinine content? Quinine solution injected into the muscles causes some degree of necrosis, probably in every case, though in the majority this may not reach a clinical level. When this necrosed tissue is absorbed, is it possible that it acts as an auto-protein therapeutic agent? Non-specific protein therapy is now used quite frequently in gynaecological practice in the treatment of subacute infections, and it seems possible that the action of the injected quinine solution may be of this nature.

Most of the points raised could be settled by controlled clinical investigation and it seems to us that it is the duty of those who recommend this method, and especially those of them who teach students, to justify a procedure which at present has little scientific support.

Whilst adhering to our own point of view, we admit the existence of others and we do not feel justified in refusing them expression in these pages, but at the same time we cannot deny ourselves the right of criticism.

Medical News

LEAGUE OF NATIONS. PROBLEM OF NUTRITION*

THE fourth volume of this important publication on the problem of nutrition has now been issued by the League. It is a preliminary study by the International Institute of Agriculture at Rome of the available statistical material on production, consumption and prices of

* The Problem of Nutrition, Volume IV. Statistics of Food Production, Consumption and Prices—Documentation prepared by the International Institute of Agriculture, presented to the Mixed Committee on the Problem of Nutrition at its Second Session, 4th June, 1936. League of Nations, Publications Department, Geneva (Switzerland). Official No. A.12(c), 1936. II. B. Pp. 110. Price 3s. Obtainable from India: The Book Company, Ltd., 4/4A, College Square, Calcutta, and League of Nations (Indian Bureau), Improvement Trust Building, Esplanade Road, Bombay 1.

the chief protective and other foodstuffs, *e.g.*, milk and dairy products, meat, eggs and poultry, fruit and vegetables, cereals and sugar. The volume deals also with the question of the financial assistance given to agriculture in some of the principal agricultural countries. Half the volume is devoted to an analytical examination of the situation in the limited number of countries for which data exist. The remainder of the volume gives valuable statistical tables relating to production and consumption, as well as wholesale and retail price indices. Despite its preliminary character this volume represents the first serious attempt to gather together and digest the somewhat fragmentary statistical information available on the vitally important question of protective foodstuffs. The volume brings out sharply the extreme incompleteness of the data available in respect of most of the foodstuffs dealt with by it; and the necessity therefore of making further serious efforts to complete these essential data on an international basis.

BUREAU OF HUMAN HEREDITY

115, GOWER STREET, LONDON, W.C.1, ENGLAND

THE object of this Bureau is collection on as wide a scale as possible of material dealing with human genetics. Later, the tasks of analysis of material and distribution of the information available will be added.

The Bureau is directed by a council representing medical and scientific bodies in Great Britain. It is affiliated to the International Human Heredity Committee, which ensures co-operation in all areas where research is proceeding.

The council would be grateful to receive all available material from institutions and individuals, furnishing well-authenticated data on the transmission of human traits whatever these may be. Pedigrees are particularly desired; twin studies and statistical researches are also relevant. As research workers and others who send in material may in some cases wish to retain the sole right of publication (or copyright) those who so desire are asked to accompany their material with a statement to that effect.

Material should be given with all available details in regard to source, diagnostic symptoms and the name and address of the person or persons who vouch for accuracy. All such details will be regarded as strictly confidential.

Reprints of published work would be most acceptable. Further, many authors when publishing material may also have collected a number of pedigrees which they have been unable to reproduce in detail. It is the object of the council that such records, by being included in the clearing house, should not be lost.

Those wishing for a copy of the *Standard International Pedigree Symbols* may obtain one from the office.

Announcements in regard to the services undertaken by the Bureau will be published from time to time.

Chairman: R. Ruggles Gates.

Executive Committee: R. A. Fisher, J. B. S. Haldane, E. A. Cockayne, J. A. Fraser Roberts, L. E. Halsey (honorary treasurer), and C. B. S. Hodson (honorary general secretary).

SWASTHYA

We have received a copy of the *Swasthya*, a 'popular' journal on health and hygiene, published monthly.

The articles are mainly based on the Ayurvedic system which is regarded by its advocates as no less scientific than Western medicine, with reference to anatomy, physiology, the microbic theory of disease, etc. It has been stated that if Ayurvedic medicines were properly studied they would prove more efficacious than allopathic drugs, in many respects. In this copy, an indigenous drug has been recommended for the treatment of malaria, in preference to quinine which, it is said, has many disadvantages; for instance, quinine cannot be used at the height of fever. (This is, we know, a popular fallacy.) There are articles on such subjects as the rules of general health and hygiene, constipation, care of the eyes, ill-effects of drinking, and on the composition of foodstuffs. These articles are of a very elementary type and are more suitable for school children. A journal of this kind could do much good, but the editors should be careful not to allow ideas that might discourage the use of that invaluable drug quinine and thereby do serious harm to their readers.

XIII ALL-INDIA MEDICAL CONFERENCE

THE XIII All-India Medical Conference will be held at Karachi in December 1936 (probable dates being 18-19-20 or 26-27-28), under the auspices of the Indian Medical Association. The exact dates of the conference will be announced later. In order to make the conference thoroughly representative of the medical profession of India, it is requested that all members of the profession should join the conference and take part in its deliberations.

As usual a medical exhibition will be held in connection with the conference. As the conference will be attended by a large number of medical men from all parts of India it will afford an excellent opportunity to dealers and manufacturers of medical requisites to exhibit their products before the delegates. Those who are willing to take stalls at the exhibition will please write for particulars to the organizing secretary, XIII All-India Medical Conference, Karachi.

There will be a scientific section at which original papers on research work, new methods of diagnosis and treatment of diseases, etc., will be read and discussed. Those who intend to contribute to the scientific section are requested to send copies of summaries of their papers to the joint honorary secretary, Indian Medical Association, 67, Dharamtala Street, Calcutta, before the 15th November, 1936.

Subjects concerning the vital interest of the medical profession in India, e.g., rural medical relief, health insurance scheme, Indian Medical Council Bill, etc., will be discussed at the conference. Branches desiring to move resolutions at the conference are requested to send advance copies of their resolutions to the secretary at the headquarters of the association, 67, Dharamtala Street, Calcutta, sending at the same time a copy of the resolution to the secretary, reception committee, XIII All-India Medical Conference, Karachi.

As usual the next annual general meeting of the association will be held at Karachi during the session of the conference. Attention of the branches is drawn to the new rules regarding submission of resolutions by branches at the annual meeting, as adopted by the central council at its last meeting, reproduced in the August issue of the *Journal*. Branches desiring to move any resolutions at the annual general meeting are requested to send copies of their resolutions in advance to the secretary, Indian Medical Association, Calcutta, in proper time.

Joint Honorary Secretary,

INDIAN MEDICAL ASSOCIATION.

67, DHARAMTALA STREET,
CALCUTTA.

THE FACULTY OF TROPICAL MEDICINE AND HYGIENE, BENGAL

THE following students are declared to have passed the L.T.M. examination, session 1936:—

Passed with distinction

Somraj Issar, L.S.M.F., Demonstrator in Anatomy, Medical School, Amritsar.

Passed

(Arranged in alphabetical order)

Naresh Chandra Bhattacharjee, L.M.P., private practitioner.

Praphulla Kumar Bose, L.M.P., private practitioner.

Sailendra Nath Bose, L.M.F., private practitioner.

Manohar Lal Chowbey, L.S.M.F., Honorary Clinical Assistant and Pathologist, District Hospital, Aligarh.

Pratulla Ranjan Dasgupta, L.M.P., private practitioner.

Santosh Chandra Datta, L.M.F., private practitioner.

Arabinda Deb, L.M.P., private practitioner.

Jitendra Nath Ganguli, L.M.P., private practitioner.

Har Bans Lal Khanna, L.S.M.F., I.M.D., Military Sub-Assistant Surgeon, Government of India.

Nalinaksha Mandal, L.M.P., private practitioner.

Chhotalal Jadavji Mehta, L.C.P.S., private practitioner.

Gour Mohan Mukherji, L.M.P., Medical Officer, Manihari Dispensary, Purnea District.

Muckattu Raman Narayanan Nair, L.M.P., private practitioner.

Santi Sekhar Nath, L.M.F., private practitioner.

Mohim Chandra Roy, L.M.F., Assistant Medical Officer, Pabhoi T. E., Assam.

Radha Gobinda Roy, L.M.F., Assistant Medical Officer, Dalmore T. E., District Jalpaiguri.

Netai Pada Sarkar, L.M.F., private practitioner.

Gouri Shanker Selot, L.M.P., private practitioner.
 Kshitish Chandra Sen Gupta, L.M.P., private practitioner.
 Promode Ranjan Sen Gupta, L.M.P., private practitioner.
 Dev Datt Seth, L.S.M.F., private practitioner.
 Sheshappa Champa, L.C.P.S., private practitioner.
 Sisir Kumar Sinha, L.M.F., Sub-Assistant Surgeon,
 Government of Bengal.

BENGAL DENTAL ASSOCIATION

THE dental surgeons of Calcutta have organized an association called the Bengal Dental Association, with its office at 26, Chowringhee Road, Calcutta. The objects of this association are: (a) To represent officially the dentists practising in Bengal. (b) To stimulate the study and research of dental science and art and to cultivate the spirit of co-operation and brotherhood amongst members. (c) To assist any association or the government in matters pertaining to dentistry. (d) To encourage co-operation, understanding, and fellowship between the members of the medical and dental

professions. (e) To protect the interests of the dental profession in Bengal. (f) To establish and maintain code of ethics and professional etiquette amongst members. (g) To organize or reorganize branches present in other parts of Bengal keeping this organization as parent body. (h) To enlighten the public about the importance of dental science and oral hygiene.

Any person graduating from recognized dental schools and colleges with hospital training, above the age of 21, and in practice in Bengal, is eligible for active membership. Medical men who graduated from recognized medical schools and colleges with dental training and whose practice is limited to dentistry are also eligible for membership.

ERRATUM

In the paper 'An Abdominal Pregnancy Developing to Full Term' by Dr. Austin da Silva, B.M.S., in the October issue of the *Gazette*, p. 591, column 1, second line from the top should read 'The foetus was 14½ inches long', and not '4½ inches long'.

Current Topics

Leukæmia: Differential Diagnosis and Treatment

By H. LETHEBY TIDY, M.A., D.M., F.R.C.P.

(From the *Practitioner*, Vol. CXXXVI, March 1936, p. 237)

LEUKÆMIA is a disorder affecting the blood-forming tissues, and is characterized by quantitative and qualitative changes in the circulating leucocytes. Nothing is known at present of its aetiology. It has never been produced experimentally and the evidence that it exists in mammals is unconvincing. The nearest approach to human leukæmia in the animal world is the leucosis of fowls which is transmissible by blood inoculation and may therefore be accepted as a virus infection, but it would be unsafe to apply this theory to human leukæmia. The enormous excess of white cells in the blood may be compared with the hyperglycæmia of diabetes and suggests that some defect is preventing the cells from performing their normal functions, and that the excess is an ineffectual response to the demands of the tissues, as in the hyperglycæmia of diabetes and the hyperplasia of the bone-marrow in pernicious anæmia. If this be so, the solution may prove to be comparatively simple and may be discovered by chance at any time. Unfortunately, at present nothing is known of the factors concerned.

There are three main blood-forming tissues, which will be mentioned only in relation to the formation of leucocytes: (1) Bone-marrow or myeloid tissue: concerned normally in the formation of polymorphonuclear granular leucocytes. (2) Lymphoid tissue, including lymphatic glands and all similar tissue elsewhere: concerned normally in the formation of mononuclear non-granular cells or lymphocytes. (3) Reticulo-endothelial or histiocytic tissue: concerned in the formation of 'large mononuclears'.

Leukæmia may develop from disorders of each of these tissues. The nomenclature for these different types has not yet become standardized. For the bone-marrow type the old term 'splenomedullary' has practically dropped out and the term 'myeloid' is more correct and most commonly in use, though 'myelogenous' is not infrequent. For the lymphocytic type, the term 'lymphatic' is incorrect, but it is still in use and its meaning is clearly understood. Either 'lymphocytic' or 'lymphadenoid' would be correct, but they are not likely to become popular, and 'lymphoid leukæmia' may be accepted for ordinary use. For the

third type, 'monocytic' or 'histiocytic leukæmia' may be used.

Leukæmia may be acute or chronic, but no case of monocytic leukæmia has lived long enough to be regarded as chronic, and the clinical differences between the three acute types are so slight that they may be considered together. In the early stages of the chronic types the red cells may show little change, but as the disease advances the erythropoietic tissue is affected, and there is an increasing anæmia. Nucleated red cells, normoblasts and megaloblasts, may be present in large numbers and may appear before the anæmia has become severe. In acute leukæmia, anæmia is usually severe from the earliest symptoms, and generally becomes extreme.

ACUTE LEUKÆMIA

Acute leukæmia is almost confined to children and is rarely seen over the age of 25 years. It may occur in infancy. The difference in frequency between the two sexes, which is marked in the chronic types, is not obvious here. The child has often been in perfect health, and the initial symptoms are not pathognomonic, but in most cases the development of malaise and pallor is so rapid and so severe that within two or three days it is clear that some serious condition is present, and a blood count may decide the diagnosis. The constitutional disturbances are severe, the pulse being rapid and feeble, and the temperature raised. No other symptoms may appear and the child may die from anæmia and exhaustion. But in other cases one or more of a number of manifestations may develop, the most prominent being ulceration of the gums and throat, hæmorrhages of all kinds, including purpura, vomiting and high fever. Some enlargement of the lymphatic glands usually develops, but this is not invariable and is usually only slight. Pale masses of a considerable size, consisting of deposits of leucocytes, occasionally form within the mouth, presenting an appearance which is almost pathognomonic. These are seen most frequently in the monocytic type. The spleen never attracts attention initially and may not be palpable at any stage. In general, the degree of enlargement of the glands and spleen and the development of the various manifestations besides anæmia and constitutional disturbances depend on the duration of the illness. The differentiation of acute myeloid and lymphoid types cannot be made on the clinical symptoms, although the lymphatic glands tend to be more prominent in the lymphoid type.

On examination of the blood certain cases can be allocated to the myeloid type on the following grounds. The number of white cells is upwards of 30,000 per c.mm. and tends to increase rapidly. It is rare for leucopenia to be present at the onset or for the count to be under 15,000, but it is not unknown. The predominant cell is a myeloblast, a primitive non-granular, mononuclear, myeloid cell. This may form 90 per cent of the total white cells, but polynuclear cells and myelocytes are always present and form a few per cent. The myeloblast may be of a large type, in which case it is readily distinguishable from a lymphocyte, and the diagnosis can be safely made of acute myeloid leukaemia or, as it is more commonly termed, myeloblastic leukaemia. But when the myeloblasts are of a small type the cells are practically indistinguishable from lymphocytes, and the diagnosis from lymphoid leukaemia may be impossible unless a definite proportion of granular myeloid cells are present. In acute myeloid leukaemia the increase in eosinophils and basophils, which is a feature of the chronic type, does not occur.

In the lymphoid form, the number of white cells at the first examination is often under 10,000 per c.mm. and not infrequently under 5,000. The number rises with the progress of the disease, but rarely exceeds 100,000. The predominant cell is a small mononuclear cell resembling a small lymphocyte, but rarely quite identical with the normal form and this cell may constitute 99 per cent of the total leucocytes, practically no other cells being present in distinction to the myeloblastic type. All the cells present are of the same type, with the exception of an occasional lymphoblast or more primitive cell, and this characteristic is important in differentiating the blood changes from those of infective mononucleosis.

The monocytic type is the rarest of the three forms. The onset is often obscure and the diagnosis tends to be made later than in the other types. The duration may be only a few days, but occasionally it is as long as three or four months. The number of the white cells is variable, and leucopenia is common at the first observation. The characteristic cell is an abnormal large mononuclear. At the first examination this cell may form not more than 20 to 30 per cent of the total white cells, but this percentage together with the abnormal appearance of the cell is sufficient for the diagnosis. Even in the terminal stages it may constitute not more than 70 to 90 per cent of the total leucocytes.

In all three groups anaemia develops rapidly and may reach a high grade. The colour index may be low, high or unity. Nucleated red cells are rarely a prominent feature, but sometimes are so numerous as to exceed the white cells. It is important to remember that a low white cell count or even a definite leucopenia may be present at the onset in all forms.

Differential diagnosis of acute leukaemia.—The differential diagnosis is of importance for while acute leukaemia is invariably fatal, it may be simulated at least temporarily by other conditions.

The hæmorrhagic diathesis (primary purpura).—This is not primarily a disorder of the blood-forming tissue, but a tendency to hæmorrhage due to abnormal permeability of the blood vessels. In chronic cases the correct diagnosis will have been established previously and only the acute forms are liable to confusion clinically with acute leukaemia, and even in these there may be a record of a previous attack of hæmorrhages. In the hæmorrhagic diathesis there is no tendency to glandular enlargement, the spleen is rarely palpable in the acute forms; the bleeding time is prolonged and the capillary resistance test is positive, but this may be so in the acute leukaemias. A careful examination of the blood cells will decide the differential diagnosis. In the hæmorrhagic diathesis there are no abnormal leucocytes; occasionally exhaustion of the bone-marrow may result in leucopenia, and as the myeloid cells are mainly affected, the percentage of lymphocytes will be

high, but this will rarely, if ever, reach the degree which is found in lymphoid leukaemia.

Agranulocytosis.—The resemblance of this condition to acute leukaemia may be very close. In the serious type which led originally to the recognition of agranulocytosis there is severe ulceration of the tonsils and faucial tissues, with rapid exhaustion and death. There may be moderate enlargement of the cervical glands, no doubt secondary to the ulceration. The pathognomonic change in the blood is the absence of granular cells, which may be complete, and this results in leucopenia with a high percentage of lymphocytes. The lymphocytes may also be diminished in number, and the total white cells may fall below 1,000 per c.mm. Anaemia is not an essential feature and there may be no changes in the red cells, even in severe types. It is now known that similar blood changes may occur with slight constitutional symptoms and with complete recovery; the differentiation of this group from acute leukaemia is not difficult since in leukaemia the patient is always seriously ill. In the severe forms the difficulty is greater, and before agranulocytosis was recognized the cases were often recorded as aleukæmic leukaemia. The very extreme leucopenia of agranulocytosis does not occur in leukaemia, and this is usually sufficient for the differentiation. Further, anaemia is rarely a prominent feature in agranulocytosis nor does it develop with the rapidity and severity which is seen in acute leukaemia. It must be borne in mind that many cases of agranulocytosis are due to taking amidopyrine and certain other benzol derivatives.

Glandular fever, infective mononucleosis and monocytic angina.—Glandular fever occurs in several forms with wide clinical differences, but all types are associated in some period of their course with enlargement of lymphatic glands and an absolute lymphocytosis. There is no tendency to purpura or cutaneous hæmorrhages. The ordinary glandular form which commonly occurs in children should not cause difficulty in diagnosis, for although the glands enlarge rapidly and to a considerable size, the constitutional disturbances are slight and the patient is never seriously ill, the clinical difference from acute leukaemia being so clear that mistakes should not arise, and, in fact, only result from errors in interpretation of the blood changes. The 'anginose' form, which was originally described on the Continent as 'monocytic angina', and thought to be an entity, may cause more difficulty and has frequently been mistaken for acute leukaemia. There is an extensive membranous tonsillitis with œdema of the neighbouring tissues, and the cervical glands are often moderately enlarged and the subcutaneous tissues œdematous. The local discomfort is considerable and swallowing of saliva may be almost impossible. The glands may be painful, but sometimes tenderness on palpation is strikingly slight. The lymphatic glands elsewhere may be enlarged and the spleen palpable. The temperature may be high, but there is no anaemia or hæmorrhages and the constitutional disturbances are slight compared with the condition of fauces and neck. The local condition often suggests diphtheria or a pyogenic infection. The blood changes, though exhibiting an absolute lymphocytosis, are not identical with those of acute leukaemia. The figures are most commonly from 15,000 to 20,000 white cells with 55 to 70 per cent of lymphocytes. The total white cells never exceeds 50,000, and granular cells are always present, although in extreme cases 96 per cent of the cells may be non-granular. But the most prominent feature is the numerous types of mononuclear cells present simultaneously, which vary from typical small and large lymphocytes to bizarre primitive forms and abnormal plasma cells and thus contrast with the single type which is present in acute lymphoid leukaemia. As the patient proceeds to convalescence in glandular fever, the abnormal mononuclear cells disappear and typical lymphocytes, small or large, predominate. Diagnosis from examination of the blood might be difficult at this stage, but the clinical course by this time has removed the possibility of leukaemia. In all types and at all

stages of glandular fever the presence of the so-called 'heterophile antibodies' in the blood provides an absolute diagnosis. The presence of these bodies is exhibited by their power in agglutinating sheep's red cells. The test is easily performed but needs the resources of a laboratory. The remarkable phenomenon, which was discovered by Paul and Bunnell and has been repeatedly confirmed, is exhibited by no other known disease.

Lymphocytosis may reach a high grade in whooping cough and in rubella, and occasionally during the course of typhoid and other fevers, but difficulties in diagnosis are not likely to arise.

Scurvy.—The clinical symptoms may suggest leukaemia, since ulceration of the gums, hæmorrhages and anæmia develop, but the blood shows a secondary anæmia only, and there are no changes in the leucocytes.

Septicæmia.—The clinical condition may occasionally closely resemble acute leukaemia, for the constitutional disturbances are severe and hæmorrhages, purpura, enlarged glands and a palpable spleen may be present. In very rare cases the polynuclear leucocytosis may exceed 100,000 per c.mm., and such blood may contain numerous myelocytes and a few myeloblasts, but in acute myeloid leukaemia the predominant cell is a myeloblast and not a myelocyte. Acute bacterial endocarditis may cause similar symptoms. In the chronic type the blood occasionally contains an excess of abnormal mononuclear cells which may suggest those of histiocytic leukaemia, but the clinical course of this type is quite unlike leukaemia.

Hæmorrhagic specific fevers.—The hæmorrhagic forms of acute specific fevers may give a clinical picture suggesting acute leukaemia, but the diagnosis has nearly always been made before the hæmorrhages develop and the blood does not show distinctive changes.

Finally, it should be remembered that the blood should be examined in all cases of ulceration within the mouth or swelling of the gums which is resistant to treatment. Acute leukaemia, agranulocytosis, scurvy and glandular fever may all produce such lesions.

Treatment of acute leukaemia.—We are completely ignorant of any specific measures of treatment. X-ray applications and blood transfusion are certainly of no value, and the treatment causes considerable disturbance to the patient; but if there is the slightest doubt as to the diagnosis, especially the possibility of hæmorrhagic diathesis, blood transfusion should be performed, and it should not be refused if asked for by the relatives. Arsenic by the mouth tends to cause vomiting and increases the discomfort and is contra-indicated. Liver and stomach extracts have not produced any results, but there is no contra-indication to injections of liver extract and administration of vitamin C, either by the mouth or by intravenous injection of cevitamic acid (ascorbic acid). On the Continent injections of N. A. B. are invariably given in acute leukaemia, but the authorities do not claim that it has any appreciable result and employ it as a placebo.

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On examination the spleen is greatly enlarged from the outset. Cases are on record in which the spleen has been confused with other organs and it has been mistaken for rigidity of the rectus and the patient treated for gastric ulcer, but difficulties are rare. The liver is usually moderately enlarged. Leukæmic retinitis is common, and the sight may be affected, so that occasionally the diagnosis is made by an ophthalmologist. The traditional symptom of priapism

is rare, and the writer has only seen three instances. There is no enlargement of lymphatic glands. Hæmorrhages and purpura are not common features of the chronic stages and are indications that the end is approaching, especially in subjects under the age of 35. The usual duration is one to three years from the time of diagnosis in subjects under the age of 35 and somewhat longer in those over this age. The end usually comes from increasing exhaustion without the development of any special symptoms. In rare cases there is a terminal change to the acute myeloblastic type with the usual symptoms of hæmorrhages and constitutional disturbances.

The blood changes are nearly always typical on the first examination. The white cells are increased to 100,000 or up to 300,000 per c.mm. or higher, the total number of all varieties being increased. The characteristic qualitative change is the presence of primitive myeloid cells, myelocytes forming 15 to 40 per cent of the total. Myeloblasts are always present, but in the chronic stage do not exceed a few per cent, the higher their percentage the shorter being the prognosis. Basophiles are usually present in large numbers and eosinophiles are also numerous, these coarse granular cells forming a prominent feature of the stained blood. Anæmia is always present, but is rarely extreme at the onset, and it is unusual for the symptoms to attract attention primarily. The presence of nucleated red cells is variable, for they may be absent throughout or present in large numbers, megaloblasts often being as numerous as normoblasts. The colour index in anæmia is usually low, but may be unity. In the later stages, when treatment is failing, the number of white cells reaches high figures, but the percentage of myelocytes rarely exceeds 50 per cent. Nucleated red cells may become numerous. When the rare myeloblastic termination supervenes, the white cells may suddenly fall to a few thousands, and then rise rapidly in the few days before death, the cells throughout this period consisting entirely of myeloblasts.

Treatment.—The essential treatment is by irradiation. The following general points may be stated:—

(1) Life is not lengthened by x-ray treatment, but there may be periods when the spleen becomes impalpable, the blood approximately normal and the patient feels well and can undertake fair activities.

(2) X-rays are more effective than radium. Thorium and other emanations have been tried, but the reactions are too severe. The writer saw several rapidly fatal results from their use in Berlin in 1912.

(3) Applications to the spleen have most effect. When this site cannot be further employed owing to skin reactions, the extremities and not the shafts of the long bones should be selected.

(4) Treatment should be begun immediately on diagnosis. It is the universal experience that the first course of x-rays has more effect than subsequent applications, and it has been suggested that this should be withheld until late in the disease. It is more probable that it is the advance of the disease that beats the treatment than that repetition is ineffectual. The blood must be examined regularly during treatment. During the first course of x-ray applications the number of white cells falls rapidly, and over-dosage may result in extreme leucopenia and a final fatal outpouring of myeloblasts by the exhausted marrow. The last application should be given when the white cells are between 10,000 and 20,000 per c.mm. The effect continues for some time subsequently and the number may fall to normal limits. At the same time, the primitive cells become greatly reduced or may entirely disappear, and occasionally the blood is indistinguishable from the normal, though more commonly an excess of basophiles persists throughout. The red cells and hæmoglobin may return to normal without any other treatment. The applications must not be stopped too soon, and there is no doubt that the white cells should be reduced to the limit of safety. In one case in my experience a full application of x-rays was given when the white cells numbered 8,000 and were still falling. They fell

subsequently to 1,000, and it was two years before they reached 5,000 and the spleen became palpable, during which time the patient was in full work. After the blood has reached this stage it is a matter of choice whether application should be continued at regular intervals, or should be omitted until the white cells have again reached 30,000 to 50,000 and the spleen is enlarging. The decision will partly depend upon the amount of local reaction, for there does not appear to be any marked difference in the results. Occasionally the second course has the same beneficial results as the first, but this is unusual. In all cases the disease gradually beats the treatment, until application fails to have any appreciable effect.

Of other methods of treatment benzol has a similar effect to x-rays, but to a much less degree. It is a convenient treatment in the intervals of x-ray applications and should be given in capsules in doses of 5 to 10 minims, thrice daily. Arsenic is often given by the mouth, but it may cause nausea or vomiting, a serious result, and there is no evidence that it is beneficial in this form or by injections of N. A. B. The anaemia appears to be part of the disease and is not benefited by iron or by liver extract. There may be a period of a year or more of fair health while under treatment, and it is advisable to allow the patient to undertake reasonable activities or continue an occupation, as this does not appear to prejudice the progress.

CHRONIC LYMPHOID LEUKAEMIA

Chronic lymphoid leukaemia rarely occurs before the middle decades and it is commoner in old age than the myeloid type. It is about four times commoner in men than in women. It also differs from the myeloid type in a more insidious course, general enlargement of the lymphatic glands, and a smaller spleen. The subject usually comes under observation complaining of weakness, and this is not always ascribable to anaemia, which is rarely severe at the first observation, though later it may become extreme. Haemorrhages are rare, few symptoms develop, except those due to glandular enlargement, and the subject may die of exhaustion without having suffered any great discomfort, but the glandular enlargement may produce serious pressure effects.

Blood changes.—The white cells on the first observation are often from 40,000 to 60,000, and in general the number is lower than in the myeloid type. The predominant cells are lymphocytes and these constitute 90 to 99 per cent of the total white cells. The cell may resemble either the normal small or large lymphocyte and the type remains constant throughout the entire course. Occasionally both types are present, but this is rare, and usually there is only one variety. The type with large lymphocytes is rare, but it is the most chronic of all leukaemias, and subjects have been known to live for many years with only slight disability.

There is a well-recognized group of cases including all ages in which the onset and progress both of the symptoms and blood changes is insidious. The sole complaint is of moderate debility, the enlargement of glands slight, anaemia absent, and the number of white cells within normal limits and with 50 to 60 per cent of lymphocytes. For a year or more the progress may be slow and the diagnosis may be in doubt. Gradually the total number of leucocytes and the percentage of lymphocytes rise, anaemia develops and the clinical state deteriorates until the diagnosis becomes clear, and the condition typical of leukaemia. Myeloid leukaemia does not supply any corresponding group.

Diagnosis.—The group which has last been described, although rare, causes great difficulty in diagnosis and much anxiety. Questions which arise are:—(1) Is there any organic disease or may the features observed be ascribed to simple debility? The frequency with which relative lymphocytosis was observed in soldiers during the war was thought to be due to exhaustion, but a persistent lymphocytosis of 60 per cent should be regarded as outside the limits of normal, and a cause must be sought for it. If none can be found, the possibility of leukaemia cannot be rejected. (2) Glandular

fever. The lymphocytosis may persist for long periods, and has been recorded more than a year after a mild attack, but it does not tend to increase. The methods of diagnosis have already been described. (3) Lymphadenoma. Immediate diagnosis may not be possible on clinical grounds or on the blood count. A biopsy can be performed and Gordon's test carried out. (4) Tuberculous adenitis. A biopsy can be performed.

Treatment.—The only effective treatment is by applications of x-rays, but the results are not so successful as in myeloid leukaemia. This is partly due to greater age in the lymphoid form, and in older patients the effects may be slight. The number of white cells may fall, but this is rarely accompanied by any appreciable diminution in the percentage of lymphocytes. Authorities differ as to whether the effect is greater when the x-rays are applied to the glands or the spleen, but there does not appear to be any appreciable difference in the effect on the blood. But applications to the glands often cause these to become smaller and relieve the pressure symptoms besides the psychological effect on the patient.

ATYPICAL FORMS OF LEUKAEMIA AND CONDITIONS RESEMBLING LEUKAEMIA

Numerous syndromes exist which are difficult to classify and about which there is no agreement. In many cases diagnosis becomes almost a matter of opinion or of nomenclature. A few groups may be referred to. These conditions are all fatal, and treatment is confined to x-ray applications.

Alukaemic leukaemia.—This term was originally coined for a supposed group of cases in which the blood was normal, but autopsy showed leukaemic changes in the tissues. It is almost invariably applied to cases of leukaemia in which there is leucopenia or no excess of white cells above normal limits. There is a widespread but erroneous belief that the disease leukaemia predicates a large leucocytosis, but, as has been stated above, a considerable proportion of cases of acute leukaemia and of chronic lymphoid leukaemia have no abnormal number when they first come under observation. Cases of agranulocytosis have also been recorded as aleukaemic leukaemia.

Leukaemia.—Leube applied this title to a group of cases which combined the changes of pernicious anaemia and leukaemia. Cases certainly occur which can be so described, but it is now known that they have no aetiological relationship to pernicious anaemia and do not respond to liver extract.

Neoplasms and lymphosarcoma.—This includes many ill-defined conditions with varying degrees of malignancy and blood changes. The two best defined syndromes are chloroma in which the blood resembles myeloblastic leukaemia, and Sternberg's leukosarcoma, in which the blood resembles lymphoid leukaemia.

Treatment of the Neuroses

By E. W. ANDERSON, M.D., M.R.C.P., D.P.M.

(From the *Medical Press and Circular Supplement*, 29th April, Symposium No. 2, 1936, p. x)

To discuss the complex and controversial subject of the treatment of the neuroses within the restricted compass of a short article is, of course, impossible. What follows must, therefore, be only an account in the most general and didactic terms. From the standpoint of the general practitioner, however, for whom the following is chiefly intended, such general observations may conceivably be of greater value than detailed discussion as to the rival merits of this method or that, methods which necessarily demand special experience and training. Part of what the writer proposes to say will, therefore, relate chiefly to those fundamental postulates without which no psychotherapy, however great the practitioner's theoretical knowledge of a given technique may be, can possibly hope to be successful. If the writer appears to dot a few more i's and cross a few more t's than may seem to be called

stages of glandular fever the presence of the so-called 'heterophile antibodies' in the blood provides an absolute diagnosis. The presence of these bodies is exhibited by their power in agglutinating sheep's red cells. The test is easily performed but needs the resources of a laboratory. The remarkable phenomenon, which was discovered by Paul and Bunnell and has been repeatedly confirmed, is exhibited by no other known disease.

Lymphocytosis may reach a high grade in whooping cough and in rubella, and occasionally during the course of typhoid and other fevers, but difficulties in diagnosis are not likely to arise.

Scurvy.—The clinical symptoms may suggest leukæmia, since ulceration of the gums, hæmorrhages and anæmia develop, but the blood shows a secondary anæmia only, and there are no changes in the leucocytes.

Septicæmia.—The clinical condition may occasionally closely resemble acute leukæmia, for the constitutional disturbances are severe and hæmorrhages, purpura, enlarged glands and a palpable spleen may be present. In very rare cases the polynuclear leucocytosis may exceed 100,000 per c.mm., and such blood may contain numerous myelocytes and a few myeloblasts, but in acute myeloid leukæmia the predominant cell is a myeloblast and not a myelocyte. Acute bacterial endocarditis may cause similar symptoms. In the chronic type the blood occasionally contains an excess of abnormal mononuclear cells which may suggest those of histiocytic leukæmia, but the clinical course of this type is quite unlike leukæmia.

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for by many who claim some knowledge in this domain, it is only because experience shows him the ceaseless necessity for doing so.

At the outset it is necessary, of course, to have some idea as to what the term 'neurosis' implies or includes. Unfortunately, it is impossible to go into this question within the limits of the present paper. One or two observations may, however, be made. In the first place it must be understood that these conditions are not in any way separate entities, 'diseases' so to speak, but distortions and exaggerations of tendencies in the personality, tendencies which are found also in the healthy, but in sufficiently harmonious balance there to enable the individual to take his place without friction in the community. The disorders we are considering cannot be reduced to a comprehensive fundamental formula. We can speak in one group of a lack of resistance to the stresses of life, of a disproportion between stimulus and response, but to define them merely as distortions or exaggerations of tendencies would be to include other disorders which are not neuroses, *e.g.*, manic-depressive psychosis. Here a most important point is touched, for it is often merely a question of degree and even of individual opinion—that is, expert opinion—whether a case is to be regarded as 'psychotic' or 'neurotic'. There is no qualitative difference. The conditions we are considering here fall between the healthy on the one hand and the psychotic on the other, and are connected with both by fluid transitions, and that not only for the group as a whole, but for the individual, who may vary not merely from day to day, but hour to hour, now striking one as psychotic, now as perhaps merely a difficult moody person. The distinction, then, between neurosis and psychosis is an artificial one and is essentially a social matter; it has no scientific validity. At the same time it must be made perfectly clear that a very large number of the patients we are considering never in their lives become outspokenly psychotic and will never become so. It will not be denied, therefore, by any save the prejudiced that these conditions form a proper object of psychiatric study, but in virtue of the fact that they are everywhere to be found—in social life, as in the general practitioner's consulting room—they become necessarily everybody's concern, not least the practitioner's, of whose practice they are reckoned to form, in some cases, at least as much as one-third and in some practices conceivably more. The more, then, the practitioner can become interested in and influence them, the less trouble they are likely to cause to their environment and to themselves. It is particularly necessary to say this, as even the shrewd physician, speaking here more particularly perhaps of those personalities designated as hysterical, can be deceived by the apparent normality of their behaviour, and unwittingly subscribe to the mischief and intrigue which these people engender. By 'hysterical' here is meant that character whose essence is to wish to appear something more than they are or are capable of being, and who, in consequence, are always acting a part based on this inflated idea of their ego. It is this which above all things gives the stamp of unguineness and insincerity to their behaviour. Their emotionality is labile, ranging from the utmost coldness on the one hand to blazing but short-lived enthusiasm on the other. Lastly may be mentioned their highly characteristic ability to falsify all situations in the terms most flattering and soothing to themselves. This cannot stand as a definition: it is only a brief sketch of the most prominent features to serve as a finger-post. Their inclination to 'scenes' and the ease with which psychogenic disturbances of all kinds arise, cloudings of consciousness, fits, paralyses, etc., is well known. It must not be supposed, however, these are the only people who show such psychogenic symptoms. We are all capable of hysteria in greater or less degree, dependent upon that suggestibility which is a universal human trait, and which merely varies in extent from individual to individual, but is never wholly absent and whose degree is modified by bodily states, fatigue, etc., race, age, environment, education, and so forth. The

workman's compensation case is often an example of this group, and it may be said that every workman is a potential hysteric, thanks to the Workmen's Compensation Act, to an extent greater than many other members of the community. By this it is not suggested that the hysterical character is uncommon among workmen.

Another prominent group of cases is characterized by inability to reach a conclusion on things, and such topics as permit of no final answer, *e.g.*, metaphysical speculation, seem almost to exist for their torture. Some others of this group feel a compelling urge to perform all sorts of useless and apparently meaningless acts quite out of harmony with the main tendencies of the personality, the silliness and futility of which are completely evident to the patient. Here, also, the link with the healthy is found in the occurrence of such symptoms, sometimes in otherwise healthy children usually only for a short period. It would, however, be interesting to follow up the after-histories of these children to determine how far they later become victims of a similarly characterized illness. In the psychotic such symptoms often find bizarre expression, a further demonstration of the nebulous boundary line already mentioned. When we consider these so-called obsessional personalities more closely, however, we find a striking difference from the hysterical. Here the keynote is excessive conscientiousness, and frequently where the disturbance is not severe or is well under control a striking reliability in their conduct of life. For this reason the patients of this group can often deflect their energies into service of the utmost value to the community. This, of course, presupposes in all cases a sound character basis which is, however, often found in these patients. The foregoing remarks tend, perhaps, to apply more to burdensome obsessional character rather than to the illness we call obsessional neurosis.

Some considerable space has been devoted to a very brief indication of the clinical features of these two groups because they are so common and, the depressions apart, constitute the main bulk of the admissions to the Cassel Hospital. Underlying both, however, as all neurosis whatsoever, is the dominating sense of inferiority and defencelessness from which springs the difficulties these people experience in contact with their fellows. This is, perhaps, the one indubitable common factor of all the conditions under discussion.

We can next briefly consider some other common 'neuroses', but again it must be pointed out we are never dealing anywhere with separate entities but with groups of characteristics which frequently blend with one another, producing sometimes the most complex pictures. Hysterical, obsessional and paranoid features (*i.e.*, sensitiveness, bearing a grudge, believing the world is against him, others are talking about him, etc.) can all be seen together in one case, now one set more prominent, now another, compelling the observer often to leave the diagnosis open after months of observation and raising doubts often as to whether or not we really have to do with a slowly progressing schizophrenic illness.

The group of cases characterized by an effect of foreboding and fearfulness associated with certain physical signs, increased tendon reflexes, palpitation; sweating, acid dyspepsia, and many more symptoms of the kind, constitute a fairly large group in outpatient and consulting practice. The phobias or morbid fears are not classed with this group, as there is strong reason for including them under the obsessionals.

Lastly, the group of mild depressions, often with feelings of unreality of self and surroundings, and various paraesthesiae, sense of weight and pressure on top of the head, and often hypochondriasis, the condition described by that abused word 'neurasthenia', frequently a mild chronic depression, thankless subjects of therapy, the bane of the general physician. This label often covers all sorts of mild involutional and arterio-sclerotic conditions, sometimes an aberrant manic-depressive and various psychogenic disorders, as well as a facade masking at the outset such grave

conditions as general paralysis or a schizophrenia. There is room for much research in this despised group. The writer knows of one case of the kind occurring in early life which cleared up after 11 years, only to reappear again in similar form at the involution period. As to the existence of a true neurasthenia arising from predominantly physical causes, opinions differ, but it seems certain that there is a small group of such cases. They are, perhaps, rarely seen under peace-time conditions.

Lastly, in conclusion of this brief clinical preamble, the greatest stress must be laid on the rôle of heredity and constitution in the genesis of most of these disorders. But it is wise to issue a warning that too much stress can be laid on this. It seems certain in an appreciable number of cases that a bad environment in itself can generate a neurosis which on modification of the traumatic factors clears up completely. But it must be confessed that in very many case histories, taken with care, the hereditary and constitutional factors are rarely found wanting. As to the exact mode of inheritance of these disorders we are still essentially in the dark. It is often, too, a matter of great difficulty to separate the familial from the environmental influences, as in all psychiatric study. In so far, however, as these factors are inconsiderable, so much the more is the prognosis favourable. Given a fairly good family history and a good character, no case should be despaired of. Where the latter is deficient it is trying to make a silk purse out of a sow's ear. The presentation of the facts in this paragraph may seem to have been somewhat laboured. This impression may disappear, however, if the following story, told to the writer by a well-known neurologist, is borne in mind. The latter, questioning a psychotherapeutic practitioner about the incidence of morbid heredity in his cases, was informed that he did not inquire about such matters as he feared the discussion of mental disorder in the family might distress the patient.

Having said as much, it may be asked how far treatment is of avail in the neurosis. Despite the vast mass of literature on the subject we are still far from precise knowledge of the factors which modify these disorders in many cases at least. That they are capable of being modified up to the point in a considerable number of cases of becoming and remaining useful citizens has been clearly shown by T. A. Ross in his admirably careful and massive work just published, which embodies the results of treatment of the first thirteen years of the Cassel Hospital. At the end of three years 40 per cent of the patients reported themselves as well, 34 per cent at the end of five years, and a number of cases were lost sight of.

Despite the lack of precise understanding as to what effects this change in many cases, certain basic requirements of a successful psychotherapy can be enunciated. Before considering these more closely, however, it must be emphasized at the outset that the patient must be regarded as a whole, and the somatic as well as the psychological aspect of the organism considered. By this is not merely meant that search for toxic foci of which we hear so much (though, of course, where indicated this must be carried out), but the patient considered as a personality. Thus it is impossible to lay stress on the psychological aspect alone, though in treatment this is by far the most important aspect.

This form of treatment will, therefore, be first considered. It is hardly necessary to stress that the first necessity is the creation of a relationship of complete confidence and trust between the patient and the physician. It may be said this is an essential to all therapy, but in our cases the circumstances modify this somewhat. Partly as a result of their feeling of insufficiency and inferiority they tend to distrust all mankind, a distrust fostered by the attitude of former physicians and society towards them but which they have in part created for themselves. Will the present case be otherwise, they ask? The instilling of this confidence cannot be taught. It is an accepted axiom of psychotherapy that particular qualities in the physician's personality are necessary for its successful

prosecution. Whoever cannot produce this confidence in the majority of his patients on early contact with them had best abandon psychotherapy. Assuming he possesses it, however, the physician must go on to pay the closest attention to his own attitude, and he must bear certain things in mind. The first of these is the necessity for strict objectivity and detachment. It is here that the novice most frequently breaks down. Deceived by the appearance of normality which the patient often presents, he tends to take the latter's statements at their face value and react to them accordingly. To do this is as permissible as to weep with the melancholic or to associate himself with the litigation of the paranoid, and treatment is vitiated from the beginning. The doctor must remember that his true rôle is that of mediator between the patient and the community, and only thereby can he truly serve the former's interests to the full. It may be said that such objectivity is usually developed by training and experience. Much attention has been given to the situation which arises between doctor and patient in analytic writings—the so-called 'transference' and 'counter transference'. This is not the place to discuss this in detail. It can only be generally stated here that whilst feeling his way into the finest shadings of the patient's life, it is not with the whole of his personality that he does so. The doctor again must consider not only what he says but how, as even an inflection of the voice can be full of the deepest meaning to the patient. Particularly is it necessary to exercise care with the hypochondriac, for the chance remark of a physician about blood pressure, heart trouble or what not may lead to years of morbid brooding and disability. The physician again must have confidence in himself and must approach the problem with the same earnestness he devotes to any other malady. Next, the most exhaustive history must be taken from relatives and patients alike, never omitting the former, and to everything the patient says listen with the closest attention and patience. The doctor must have, above all, time to spare and be prepared for an initial interview of at least one hour. The patient must be impressed with the necessity for complete frankness and enjoined to suppress no fact, however little bearing it might seem to have on the case. Where, however, the *rapproch* already mentioned exists, few if any patients will fail to discuss their innermost life with the physician.

When the case has been summed up the question of technique has to be considered. It is probable this is of secondary importance to the personal influence of the physician. It is impossible here to discuss the merits or demerits of any particular school. All existing methods fall into the categories of suggestion (which probably forms part of all), persuasion, hypnotism, and lastly the analytic methods. As to these last it is certain that such methods are not essential to a satisfactory and continued adjustment, as Ross has clearly demonstrated in the work already quoted. It is also equally true that methods successful in the hands of a great man are not always equally efficacious when applied by his lesser disciples. The obsessional cases are commonly considered highly suitable to analysis, and many claim that this is the only satisfactory treatment. The writer, however, remembers cases which have cleared up without it, and indeed without any treatment at all. In particular one severe case with most tortuous symptomatology, compulsive thoughts in connection with religion, etc., with *prima facie* bad prognosis, who ultimately became well enough to resume her employment and regain her former happiness. Had any psychotherapeutic method been employed here it would certainly have received the credit. It must be remembered, of course, that many of these obsessional cases run a phasic course.

With regard to analysis, the problems and pitfalls inherent in this mode of treatment are not always recognized by the majority of the extra-psychiatric profession. First of all, the number of cases suitable for this method is much smaller than is commonly recognized, and their selection is an expert matter. To

discuss this further is impossible as it would mean raising fundamental questions as to diagnosis which would be quite out of place here, even if space permitted. Its application must be left to those who by training are aware of its dangers (which are very definite), and as a method it is quite unsuitable for general practice, quite apart from its prodigious duration, in many cases extending up to years. Perhaps the writer has seen more of its failures than its successes, and for this reason has less enthusiasm than many, but the method can never be disregarded for that reason and in some cases may prove the only adequate weapon.

Persuasion (associated with the name of Déjerine) and re-education is often most successful, and is, perhaps, the most widely applicable of all, with the diversion of energies hitherto morbidly engaged into a socially useful path in which occupation therapy can often play a notable part. This so-called 'sublimation' is probably an essential to any lasting recovery.

Suggestion, waking or hypnotic—the writer abjures the latter as a therapeutic agent—will in very many cases abolish symptoms and if suitable modifications in the life situation are made, coupled with some discussion along psychological lines, lead to a lasting adjustment. As a modification of the last-mentioned method the author has found the 'Concentration Exercises' of J. H. Schultz of considerable value. This, according to the latter, rests fundamentally on the production by suggestion of an inhibition of muscle tonus: first in individual limbs, later applied to the whole body, thus producing a feeling of heaviness. They can be employed later for the abolition of symptoms. They are not applicable to every case, but are often highly successful as *e.g.*, in a case of intractable insomnia recently under the writer's care, where it was possible by this means to restore natural sleep. It is impossible in the available space to describe the method further.

Concluding this section, it should be said it is usually better to listen than to talk, and the patient should always be allowed to tell his story with the minimum of interruption. The mere unloading of pent-up fears and difficulties often produces striking relief in itself.

Brief mention may now be made of certain general measures. Alcohol, tobacco, coffee and tea should be eliminated from the diet of many, especially of those with vegetative disturbances, *e.g.*, migraine, etc.,—a large group. Allergic phenomena should be investigated and diet modified accordingly where this is practicable. Climate is not without significance; the anergic, listless patient usually does best in a bracing atmosphere, and it is possible the question of climate deserves fuller consideration chiefly from the prophylactic viewpoint, *e.g.*, in preventing certain constitutional neurotic types from working in the tropics.

The influence of the hospital as a whole is one of the great imponderables in treatment of which there are so many. It can come to play a considerable part in adjusting the patient to the larger community. In this respect team games and occupational therapy are of the highest value.

With regard to prophylaxis the question of marriage comes first. This should never be lightly recommended to a neurotic, for few of them are able to bear its stresses, as well as for eugenic reasons. It cannot, however, be forbidden wholesale; a careful study of the family history must be undertaken in conjunction with individual factors. Here the scheme for voluntary pre-nuptial health examinations inaugurated by the Eugenic Society may prove of assistance in many cases where the doctor is in doubt.

As far as the training of psychopathic children is concerned the following rules formulated by Ziehen and given here in condensed form may prove helpful: (1) Total abstinence from coffee, tea, alcohol, spices and tobacco up to and including puberty. (2) Supervision of the sexual life. (3) Hardening by cool rubs down, habituation to pain and exertion; gymnastics and sports; supervision of reading; daily routine in all cases regulated by definite schedule. (4) Attendance at

a public school. (5) Removal from parents where home environment is unsatisfactory. (6) Habituation to obedience and self-control by means of calm severity; avoidance of passionate scolding.

They are perhaps a little Teutonic for rigid application in this country, but applied with common sense and discretion, they should do much to inculcate that 'health conscience' which so many of our patients notably lack.

The question of choice of career also arises, and the practitioner can often exert considerable influence on this. The subject is too large to discuss here, but the services of the Vocational Guidance Section of the National Institute of Industrial Psychology may be mentioned in this context. A person may be intellectually fitted for work for which his personality and character endowment render him quite unsuitable.

As to the aim of therapy this is perhaps not as self-evident as it might seem. To the writer the aim is to produce a useful citizen; whether he enjoys complete personal happiness is of less importance, the two are not mutually dependent, as everyday experience shows. In saying this the writer realizes he is at variance with many.

With regard to the physician's attitude towards these illnesses, it is necessary to stress the avoidance of any sort of moral valuation, otherwise the patient may be driven to despair or defiance. The rôles of the physician and the priest do not coincide; unfortunately this is often forgotten. At the same time no rules can be laid down here, for, although it cannot safely be practised without certain special knowledge, psychotherapy is an art. Although the foregoing is probably the safest rule for those with little experience, it is often true that, notably in dealing with hysterical personalities, a sturdy puritanism is preferable to the hedonistic condonation of psychopathic behaviour inspired by certain continental schools. In the bourgeois circles, from which we mostly draw our patients, it is usually better to encourage them to leave pioneering in a new ethics to a better integrated personality. A little elementary knowledge of the world is often worth more than theoretical doctrine, for the fool will not make a psychotherapist.

It has been the writer's aim to develop an orientation on the practitioner's part towards the problem rather than to put ready-forged weapons into his hands, as well as to clear away some current misapprehensions. If he has succeeded in this he is satisfied.

Treatment of Hæmorrhagic Diseases

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(From the *British Medical Journal*, Vol. I, 25th April and 2nd May, 1936, pp. 850 and 895)

THE hæmorrhagic diseases include various conditions of which the pathology and treatment differ widely. The sole constant feature is a tendency to hæmorrhage, though this differs in its nature and causation in the various groups. In discussing the treatment it will be assumed that an ordinary blood count is available, including the number of red cells and the percentage of hæmoglobin, and the number of white cells, with a differential count. The following classification of the hæmorrhagic diseases will be adopted:—

A. Primary non-hereditary hæmorrhagic diathesis

1. Purpura hæmorrhagica: (a) acute; (b) chronic.
2. Anaphylactoid purpura (including Henoch's purpura and purpura rheumatica).

B. Symptomatic hæmorrhagic states or secondary purpura

The important causal factors under this heading are: (i) infectious diseases; (ii) infections with pyogenic cocci; (iii) drugs, including benzol derivatives, gold preparations, salvarsan; and (iv) sensitivity to proteins.

C. Haemorrhagic deficiency disorders

1. Scurvy.
2. Melena neonatorum.

D. Hereditary haemorrhagic disorders

1. Haemophilia.
2. Hereditary haemorrhagic diathesis, including fibropenia and types which are intermediate with haemophilia.
3. Hereditary capillary telangiectasia.

PRIMARY NON-HEREDITARY HAEMORRHAGIC DIATHESIS

It may be said, briefly, that the essential factor in the causation of the haemorrhages is undue permeability of the capillary endothelium, which may be chronic, sporadic, or intermittent. The cause of this increased permeability is uncertain, but it is not directly due to diminution of blood platelets. These may be completely absent without the development of haemorrhages; the term 'essential thrombocytopenia' is thus a misnomer, and should not be used. The increased permeability may permit the passage either of plasma only, or of blood cells, or mainly of plasma with a small amount of blood. If plasma alone escapes the resulting condition is urticaria, which will not be further referred to. If blood escapes the resulting condition is purpura haemorrhagica. If plasma escapes, with some amount of blood, the resulting condition is anaphylactoid purpura.

The clinical and laboratory characteristics of the haemorrhagic diathesis during periods of activity are:

1. *Haemorrhage*.—Haemorrhage from the mucous membranes and into the superficial and deep tissues, constituting purpura, petechiae, ecchymoses, and haematoma, may be at any site; cerebral haemorrhage has often been the final cause of death. It is now known that certain cases of repeated haemorrhage from a single site, such as repeated epistaxis, haematuria, and menorrhagia, belong to the haemorrhagic diathesis.

2. *Prolongation of the bleeding time (Duke's test)*.—This test is the most important and sometimes the sole evidence that the haemorrhagic tendency is active at the moment of examination, and while the test is easily performed it is essential that it should be done properly. A deep, sharp prick is made in the ear with a cutting needle, and the blood is soaked off with filter paper or soft blotting-paper every twenty seconds. No pressure must be used. In normal persons the bleeding ceases in one to two and a half minutes. When the haemorrhagic diathesis is active it is prolonged to many minutes or even an hour. A normal bleeding time does not in itself prove that the individual is not a subject of the haemorrhagic diathesis, but only that there is no active tendency to haemorrhage at that moment.

3. *Capillary resistance test (Rumpel-Leede test)*.—This is performed by constricting the arm with a sphygmomanometer band at a pressure of 70 mm. for two minutes. When the haemorrhagic diathesis is active a crop of petechiae appears below the band. This test may be difficult to estimate if there is already extensive purpura. It becomes negative when the active tendency has subsided, but usually persists longer than the prolongation of the bleeding time.

In addition to these features the blood platelets tend to be reduced in number, and in serious cases may be almost or completely absent. Even complete absence is not a proof, however, that the haemorrhagic tendency is active at the moment, but must be regarded as evidence that if haemorrhages do arise they are likely to be severe. There are no constant or characteristic changes in the blood cells. Anaemia will inevitably be present, if the haemorrhages are severe or chronic. Leucopenia is evidence of exhaustion of the bone marrow, which may be temporary or permanent.

ACUTE PURPURA HAEMORRHAGICA

This may be seen at any age, though it is commonest in childhood. The onset is sudden and progress rapid, but rarely attains the severity of the 'purpura

fulminans' of the symptomatic purpuras, for which there is an obvious predisposing cause.

Treatment is local and general. It is important to remember that the majority of cases recover even in the absence of any specific treatment, since the acute haemorrhagic tendency may cease as suddenly as it began. After recovery the patient may remain free from all symptoms for many years, or even throughout life.

Local treatment is only of use for checking gross haemorrhage from a mucous membrane, and should be carried out in accordance with ordinary procedures and the special methods described under haemophilia. General treatment aims at aborning the general haemorrhagic tendency, temporarily or permanently. The measures which need careful consideration are blood transfusion and splenectomy.

Blood transfusion

Transfusion may end temporarily the active haemorrhagic tendency, apart from the benefit which the anaemic patient will derive from the volume of normal blood. It is better to transfuse moderate quantities, and repeat if necessary, than to give a large amount and risk a severe reaction.

Blood transfusion is indicated in all cases of acute purpura haemorrhagica and should be performed as soon as the diagnosis has been made, as the future course cannot be predicted. The blood must be carefully grouped and cross-grouped with the prospective donor's blood. Serious reactions are not common, though more frequent than in normal individuals, but it is proper to run the risk of their occurrence. Occasionally in severe cases the transfused blood is hemolysed rapidly and the haemoglobin excreted even after careful grouping. The amount injected should be about 300 c.cm. for an adult, and there is no objection to using citrated blood. The bleeding time must be watched subsequently, and if there is no evidence of a definite reduction in twelve hours the transfusion should be repeated. If a skin incision has to be made in order to find a vein it is advisable not to put stitches into it as a troublesome haematoma usually forms.

Auto-agglutination in the patient's blood is occasionally a difficulty, though it is more common in the symptomatic group. In these circumstances the patient's serum usually agglutinates all other bloods when tested in the usual manner, and the group cannot be ascertained. Auto-agglutination, however, is confined almost entirely to reactions at room temperature, and does not take place at blood temperatures. If there is difficulty in estimating the reaction at a temperature of 37°C. a group-IV donor should be employed; this has been done safely on several occasions, although the patient's blood may contain haemolysins which rapidly hemolyse the donor's blood.

Splenectomy

There can be no doubt that a successful splenectomy brings to an end the haemorrhagic tendencies in a high proportion of cases, but nevertheless the decision to operate must not be made lightly.

Splenectomy in otherwise normal individuals, as, for example, following trauma, is followed by a rapid rise of the blood platelets and the leucocytes. The platelets rise to their maximum in a few days and return to normal in about three weeks. It is worthy of mention that a rise of platelets follows any major operation, but is less rapid than that which follows splenectomy. After splenectomy for purpura haemorrhagica the rise in platelets may be very rapid and marked, and if the number has been within normal limits at the time of operation may reach a level at which there is a serious danger of thrombosis, which has been observed in several cases. In acute purpura haemorrhagica of great severity it may be said that the platelets are always definitely diminished in number, and the risk of thrombosis does not arise. If the platelets are found to be within normal limits with the clinical manifestations described it is more probable that the case belongs to the symptomatic or hereditary group.

In deciding if splenectomy should be performed in a case of primary acute purpura hæmorrhagica several factors must be taken into consideration:—

1. Many patients recover without specific treatment, since the active hæmorrhagic tendency may stop at any moment, and these patients may subsequently remain free of any symptoms for many years or throughout life.

2. The operation has a high mortality, and it must be decided whether or not the patient is so ill that the chance of surviving such an operation is almost hopeless.

3. The previous history must be carefully considered in order to make certain, if possible, that the patient really belongs to the group of primary non-hereditary hæmorrhagic diathesis.

4. Blood transfusion must always be tried first, but if at the end of twenty-four hours, after two transfusions, the bleeding time is still excessive and shows no sign of returning to normal then, but not before, the question of splenectomy must be seriously thought of. The wait of twenty-four hours is fully justified, for it will undoubtedly save some patients from an operation which they would be unlikely to survive.

When this position has been arrived at and the factors already mentioned reviewed splenectomy is justified only if the hæmorrhages are continuing, the hæmoglobin percentage is falling, and the general condition is deteriorating. There are some further subsidiary points which are to be taken into consideration. Leucopenia suggests that the bone marrow is exhausted temporarily, and this would weigh in favour of operation. A high platelet count would be a distinct indication against splenectomy. It is best to come to a decision on the conditions existing at the moment, and not to be swayed by the history of previous attacks. It is difficult to know in which direction these should weigh, for if a patient has survived previous attacks he may well survive the present one, although he would be exposed to the risk of recurrence in the future. In the case of a child who has recovered from previous attacks the parents would rarely consent to an operation which could be performed with much less risk when the acute attack had passed.

With regard to the operation, splenectomy should be undertaken if possible. Adhesions may render this difficult and the operator may have to be satisfied with ligation of the splenic vessels, the results of which operation are still uncertain. A blood transfusion should always be given at the time of operation, but it is not right to delay transfusion because the question of splenectomy may shortly arise.

Results of splenectomy

It is difficult to estimate with exactitude the dangers and results of splenectomy. Many of the patients who die after the operation would undoubtedly have died in any circumstances, but splenectomy is a serious operation in acute purpura hæmorrhagica and is undoubtedly associated with a high operative mortality. It must also be remembered that many patients recover without operation, even when *in extremis*.

In favourable cases the hæmorrhages cease with extraordinary rapidity after operation. It is said that hæmorrhages can be seen to cease immediately the spleen is removed. The blood platelets rise rapidly, undoubtedly due to flooding of the circulation with reserves from the bone marrow, as happens after splenectomy for other conditions. In the course of two or three weeks the platelets fall to an ordinary level. Recovery from the operation may be uneventful and the hæmorrhages completely disappear, and no subsequent symptoms may arise for a course of years. Nevertheless, it is known that even in such cases serious hæmorrhages may recur after long intervals of freedom.

Occasionally the platelets rise to a high or a normal level with cessation of the hæmorrhages and then subsequently fall to a low figure. Hæmorrhages may not immediately recur, but they tend to do so later. This

course is, however, more common in the chronic than in the acute form. In a few cases the blood platelets entirely fail to rise. In spite of this the hæmorrhages may cease for a few days, but they then recommence, usually with a rapidly fatal termination.

In addition to blood transfusion and splenectomy, many other methods of treatment have been advocated and supported by a record of cures, but, in considering these, the tendency to spontaneous recovery must be borne in mind.

Other methods of treatment

Good results have been claimed for vitamin C in the pure crystalline form of cevitamic acid. If this is correct it brings the primary hæmorrhagic diathesis into line with scurvy, which is not impossible; this method of treatment needs further testing. Cevitamic acid must be injected intravenously, being admittedly useless by the mouth, and the dose should be 150 mg. daily until the hæmorrhages cease. This method is worthy of trial together with blood transfusion. There is no evidence that the injection of whole blood or of horse serum intramuscularly is of any value.

Several attempts have been made to use snake venom, the venom of certain snakes being coagulant, and good results have been claimed. Antivenin serum, prepared by immunizing horses against the venom of certain snakes, particularly the genus *Bothrops*, has been injected intramuscularly in 10 c.cm. doses. Another method has been the intradermal injection of filtered diluted snake venom. The venom of the copperhead snake has been tried in dilutions of 1 in 3,000 and 0.1 c.cm. injected daily for several days. The number of recorded cases is small, but it is not impossible that snake venom may prove helpful.

Attempts have been made to 'block' the reticulo-endothelial system by the injection of various substances. The most recent method is by the intravenous injection of 10 c.cm. of a 1 per cent solution of Congo red. It is known that such injections raise the number of blood platelets experimentally in animals, though the amount used has been much larger than is recommended for administration to human beings. Liver extracts in any form are entirely useless.

During convalescence the treatment should be on common-sense lines. The diet should contain a sufficiency of vitamins, and iron will be indicated for the treatment of the anæmia. All septic foci should be appropriately treated.

CHRONIC PURPURA HÆMORRHAGICA

The problem of treatment in this group differs essentially from that in the acute group, since there will be ample time to consider the appropriate measures. There will be no expectation that the tendency to hæmorrhage will stop permanently. When beginning in childhood it may diminish with advancing life, but this is not invariable. In all cases septic foci should be carefully treated. The results of splenectomy have been satisfactory, and therefore an important question to decide is whether or not splenectomy is indicated. The operative mortality is about 8 per cent, although some surgeons have reported series with lower death rates.

Many (but not all) of the patients on whom splenectomy has been performed have remained free from all symptoms over a course of years. In some cases, however, the hæmorrhages continue in a slighter degree for some weeks or months before ceasing; in others the hæmorrhages continue permanently with diminished severity. It is important to note that some of the patients in whom the results have appeared entirely successful, no hæmorrhages developing for several years, gradually return to a severe hæmorrhagic state. A small proportion of cases show no benefit, but this is exceptional. Prognosis is difficult, and while the results are, in general, satisfactory the possibility of a less successful termination must be borne in mind and put before the patient or those responsible.

Indications for splenectomy

The first question that will arise is whether the severity of the condition is such as to allow life to continue without serious impediment to reasonable activities and without risk in the near future, in the absence of operation. The manifestations may have been so mild over a course of years and the general condition may be so good at the time of examination that the risk of an operation would clearly be unjustifiable, but it should be remembered that the question may need to be reconsidered in the future. If operation cannot be dismissed on these grounds other circumstances which must be considered are: the age of the patient and the general physical condition; the previous history; the extent of the hæmorrhages and their duration; evidence of increasing severity; the degree of anæmia; and whether the white cells are increased or decreased. With regard to the last point, leucopenia is evidence of exhaustion of the marrow, which may be temporary or due to advancing aplasia. Permanent leucopenia is a serious sign, for it will increase the risk of operation; on the other hand, it is evidence that the bone marrow is unequal to the demands made upon it, and it is therefore best to regard leucopenia as favouring splenectomy. If there is a definite leucocytosis then the bone marrow is able to react and the decision is of less urgency. The size of the spleen is not an important factor. If the number of platelets is below 100,000 per c.mm. it should weigh in favour of, and if above 150,000 it should weigh against, splenectomy. In the latter case there is a risk of subsequent thrombosis, and in the former the farther the number falls below 100,000 the greater evidence is it of the activity and severity of the hæmorrhagic tendency.

Estimating hæmorrhagic activity

The bleeding time and the capillary resistance test must be recorded, a great prolongation of the bleeding time being an important sign. These tests are a measure of the activity of the hæmorrhagic tendency at the time of examination, and may be valuable as evidence that it can attain a high degree of severity. But in quiescent periods the tests may be normal, and this must not be regarded as an indication that serious hæmorrhages will not occur.

A case of chronic purpura hæmorrhagica must be watched, the various examinations repeated, and the decision as to splenectomy based on observations over a satisfactory period. Only rarely is it justifiable to decide to operate on the strength of a single examination. The risk of operation will be less when the bleeding time is normal.

Blood transfusion cannot have more than a temporary effect on the hæmorrhages, but may benefit the anæmia considerably in chronic purpura hæmorrhagica. Blood transfusions repeated from time to time may be sufficient to keep other subjects and borderline cases in a reasonably satisfactory state without exposure to the risks of operation. The amount injected should be from 500 to 700 c.cm. A pre-operative blood transfusion is always necessary.

Other methods of treatment

In addition to the methods of treatment described for the acute form there are others which have been used in the chronic. Calcium has been given in large doses, but its administration is valueless, for there is no shortage of calcium in the blood and no prolongation of the coagulation time.

Protein shock, either by injection of T. A. B. vaccine or of tuberculin, has yielded good results in children. I have had most unfortunate experiences of its use in adults, and would regard it as dangerous. There are well-authenticated cases in which hæmorrhages have been prevented over many years by injections of adrenalin, 1 in 1,000 solution, 3 to 5 minims, and it is worthy of trial in cases beginning in childhood. It is only rarely effective, but in such

cases its action is obvious in a few days. There is no evidence that ultra-violet light has any specific effect. Treatment with turpentine or with arsenic is also valueless.

ANAPHYLACTOID PURPURA

THIS type of purpura lies between urticaria and purpura hæmorrhagica, and includes both Henoch's purpura and purpura rheumatica. There is an escape from the vessels of much plasma and little blood, but as a small number of blood cells can stain a large area of tissue impregnated with plasma this leads to the formation of extensive ecchymoses, which suggest the escape of much blood. The escaping plasma manifests itself in urticarial forms such as abdominal pain, diarrhoea, colic, and pain and swelling of joints. The patient is more sick than purpuric. As might be expected the signs and symptoms of purpura hæmorrhagica are less marked in this group. Thus the degree of anæmia is less. The platelet count is diminished in the severer cases often to the neighbourhood of 100,000 or 150,000 per c.mm. The statement that the platelets are not reduced in this group is incorrect, but even when the constitutional symptoms are severe and there are considerable ecchymoses the number of escaping blood cells may be small and the degree of anæmia and reduction of platelets will be slight. The bleeding time and the capillary-resistance test may or may not be abnormal.

Anaphylactoid purpura usually appears first in childhood; it may continue into or cease in later life. It is, however, erroneous to suppose that it is confined to childhood, as its first manifestations may not be shown until the middle decade. There is a definite predisposing factor in some cases, and before further treatment is undertaken it is essential to ascertain whether there is any focal sepsis or any sensitivity to items of food or foreign protein. In its pathogenesis this group has no inherent difference from purpura hæmorrhagica, and the questions of splenectomy and blood transfusion should be considered on the grounds which have already been discussed.

Certain special points apply to this group. Constitutional disturbances during attacks may be so severe as to interfere with education or occupation, but they should not be regarded as a decisive factor, for they tend to diminish with the passing of time. In the absence of anæmia and with a normal platelet count operation is contra-indicated. Infususcception due to an area of swollen gut is a not infrequent complication, and should be remembered when diarrhoea is marked and the motions contain blood. The urine of some patients contains a large amount of albumin during acute attacks. This is due to protein sensitivity rather than nephritis, and in such cases special search should be made for some causal agent. The risk of the development of nephritis has been exaggerated in the past.

Treatment.—Intramuscular injections of horse serum, 10 c.cm., or of whole blood, 10 to 20 c.cm., have temporary beneficial effects in some patients although in others, apparently similar, they may fail entirely. The other methods of treatment described for purpura hæmorrhagica also apply in these cases.

SYMPTOMATIC HÆMORRHAGIC STATES OR SECONDARY PURPURA

This group differs essentially from those which have already been discussed in that there is a primary causal factor, the influence of which varies greatly, since it may be still continuing in some cases whereas in others it has ceased and is non-recurrent. For example, in the case of a streptococcal septicæmia the recovery from the causal factor is practically hopeless, and the hæmorrhages can only be regarded as a terminal incident; in purpura due to drugs the causal factor, if discovered, may be regarded as non-recurrent. It is not always easy to find out from a sick patient that

such a drug has been taken recently. With regard to the infectious fevers it must be borne in mind that the hæmorrhagic tendency may develop at different periods. Thus it may appear at the time of the eruption, but sometimes it arises considerably later, when convalescence would seem to have begun. When associated with infectious fevers or drugs the hæmorrhagic tendency is transient, lasting only until the effects of the drug or the infection have worn off; there will be no further tendency to hæmorrhages unless the same or a similar factor reappears. Obviously the object of treatment is to tide the patient over the dangerous period.

In the presence of definite septic foci, such as otitis media, the position is more difficult as the cause is still operative. The focus of infection must be dealt with, but as little operating as possible should be done. In the symptomatic group the hæmorrhagic tendency is sometimes of such extreme severity as to come under the heading of purpura fulminans, the mortality of which is very high.

The general indication is to make every effort to tide over the immediate hæmorrhagic period. It can properly be said that blood transfusion should always be performed, but splenectomy is absolutely contra-indicated. Blood transfusion should be carried out according to the principles already described. It should be repeated at short intervals if constitutional disturbances are severe, if the bleeding time remains prolonged, and if the anæmia is increasing. The introduction of injections of vitamin C as cevitamic acid is so recent that at present there is no record of its use in this group, but its trial would be fully justified. Protein shock is clearly contra-indicated in an acute condition in which sensitivity may be an important factor. Severe bleeding from a single mucous membrane will call for the usual methods of treatment or the special methods referred to under hæmophilia.

HÆMORRHAGIC DEFICIENCY DISORDERS

Scurvy

The specific treatment of scurvy has now been reduced to a simple form by the preparation of L-ascorbic acid or cevitamic acid in a pure form. This is rapidly effective in scurvy when given by the mouth, but can also be safely injected intravenously. The dose by either method varies from 50 mg. in an infant to 150 mg. in an adult for a daily injection. This should be continued until improvement is obvious, usually from four to eight days. Subsequently orange juice, 50 to 100 c.cm., should be given by the mouth. Recovery is rapid and the anæmia scarcely needs treatment even by iron. The dietetic deficiency which has led to the onset of scurvy must necessarily be corrected for the future.

Melæna neonatorum

This curious condition in new-born infants between the third and tenth days is not hereditary, has no relation to the hæmorrhagic diathesis, and is apparently distinct from hæmophilia. The pathogenesis is unknown, but it is probably due to some deficiency. The bleeding is usually from the bowel, but may be from any mucous membrane. The specific treatment is the intramuscular injection of 10 c.cm. of whole blood. The blood can be drawn direct into a syringe from the vein of the mother or any healthy person and injected immediately, grouping being unnecessary. A single injection is often sufficient, but it should be repeated once or twice a day if the hæmorrhages continue. Blood transfusion is only indicated if the amount of blood lost has been excessive. There is no subsequent tendency to recurrence.

HEREDITARY HÆMORRHAGIC DISORDERS

There are several groups of hereditary hæmorrhagic disorders which have no direct connection with each other, although there are intermediate forms which are difficult to classify.

Hæmophilia

The hæmorrhage in hæmophilia consists of a steady ooze at the site of trauma as distinct from the purpuric spots and petechiæ of the hæmorrhagic diathesis. It is now recognized that the females of a hæmophilic family may have an abnormal tendency to bruising and bleeding and the coagulation time may be somewhat increased, but rarely do females exhibit the full manifestations of hæmophilia. If a hæmophilic male marries a female of a hæmophilic family one child in four should be a female hæmophiliac, but even this possibility is made very remote by the fact that few males live to have children. There is no known cure, and all treatment is transient and directed towards stopping the immediate hæmorrhage. The hæmophilic tendency is intermittent and the coagulation time may be temporarily normal, but it must not be considered that the patient is safe from hæmorrhage in such circumstances, since there is reason to believe that with any stimulus, such as trauma and slight hæmorrhage, the condition rapidly returns.

General treatment of hæmorrhage

Hæmophiliacs at an early age are always aware of their disability and become greatly perturbed at the continuation of bleeding. The patient should be put to bed at once, kept quiet, and given morphine without hesitation if necessary. Blood transfusion has the effect of reducing the coagulation time, and may even bring it close to normal limits, but this only lasts for about five days. A hæmophiliac does not bleed from the puncture made by a sharp needle, and blood transfusion can safely be performed; the amount injected should be from 300 to 500 c.cm. Transfusion should always be undertaken immediately before any operative procedure.

The injection of whole blood intramuscularly may reduce the coagulation time. This is less definite than the effect of blood transfusion, but has the advantage that the blood need not be of the same group as the recipient's. Injections of normal horse serum, from 20 to 30 c.cm., may also be employed intramuscularly. It has been suggested that such injections should be given at frequent intervals with the idea of maintaining a normal coagulation time, but the duration of the response is so short that the practical difficulties are insuperable, apart from the risk of producing hæmatomata.

The administration of calcium has proved of no value; it is striking that the blood calcium in hæmophilia is abnormally high, usually 13 to 14 mg. per 100 c.cm. Liver extract also is ineffective. Oestrogenic hormones have been tried on the theory that some female sexual characteristic protects females, but no good results have been observed. Protein shock and injections of adrenalin are useless. There are no records of the intravenous injection of cevitamic acid, but anti-scorbutic methods by the mouth have no effect.

The most efficient treatment at present of a hæmophilic subject involves the most careful avoidance of trauma and the treatment of hæmorrhage, when it occurs, by blood transfusion, repeated when necessary and locally by the application of a diluted solution of Russell's viper venom.

Local treatment

The local application of the diluted venom of certain vipers has been found highly effective in controlling the hæmorrhage. The credit for the practical application of this method is due to R. G. Macfarlane and B. Barnett, whose writings are here followed. The most powerful coagulant venom is that of Russell's viper. This is now prepared by Messrs. Burroughs Wellcome and Co. under the name of stypven, and is issued in the form of dried venom, together with ampoules of sterile water for solution. The venom is sterilized by passage through a Berkefeld filter and used in a dilution of 1 in 10,000, at which strength it has no toxic effects; it keeps well when dried in ampoules, but is not stable

in solution. It is also effective in checking the local hæmorrhages in the hæmorrhagic diathesis.

The bleeding site should be carefully cleaned and useless clots removed. A dressing of gauze is then applied soaked in equal parts of diluted venom solution and adrenalin 1 in 1,000. Pressure should only be sufficient to keep the dressing in position; in the mouth a carefully fitted plate may be necessary. The results have been extremely satisfactory, and the venom can be applied on numerous occasions without affecting the patient and without losing its powers. If viper venom is not obtainable, the wound should be carefully cleaned and fresh normal blood applied on gauze. This undoubtedly has some power to coagulate hæmophilic blood. The application of adrenalin 1 in 1,000 temporarily checks the hæmorrhage, but is not of permanent value. Pressure should only be applied for the purpose of retaining a dressing in contact with the bleeding site. The cautery is worse than useless. Hot water and hot air have no appreciable effect. When hæmorrhage has occurred into a joint the blood should be aspirated and the joint elevated and lightly bandaged with cold applications. Hæmatomata should also be aspirated.

HEREDITARY HÆMORRHAGIC DIATHESIS

This group is much rarer than the non-hereditary form. The diathesis may be transmitted and exhibited by both sexes. In many of the cases the manifestations are identical in every way with those in the non-hereditary group, and it is difficult to know whether they should be regarded as possessing a different pathogenesis. It has been said that splenectomy is contra-indicated in hereditary cases, but there is on record a family of which the father was operated upon with complete success many years ago, but the child

died after splenectomy without any rise of the blood platelets. On the whole it is best to neglect the hereditary factor and consider the treatment of the hereditary group on exactly the same lines as the non-hereditary form. There are a number of patients whose symptoms and signs do not conform exactly with those of a hæmorrhagic diathesis, and many of these appear to be intermediate between the hæmorrhagic diathesis and hæmophilia. Thus the diathesis may be transmitted through males and exhibited by both sexes, the coagulation time may be considerably prolonged, while the blood platelets may be normal and the bleeding time variable. In such a case the normal number of platelets would contra-indicate splenectomy. Many variations of the manifestations exist, and each case must be judged on the principles already enunciated. During an acute attack it can never be wrong to give a blood transfusion. Cases of a similar character occur without a hereditary factor and have to be dealt with on the same lines.

In a very rare group of cases, the so-called fibropenia, the tendency to hæmorrhage is due to a deficiency of fibrinogen in the blood. No treatment is known which will remedy this deficiency.

HEREDITARY CAPILLARY TELANGIECTASIA

In this condition fragile naevi of various shapes and kinds develop in the skin and mucous membrane, probably owing to congenital weakness of the capillary endothelium. The naevi tend to rupture and bleed, and thus produce anæmia. A local bleeding naevus if accessible can be treated either by the cautery or by pressure, but neither method is very successful, and probably snake venom would be better. Many of these patients finally die from a slowly advancing anæmia.

Reviews

THEORY AND PRACTICE OF PSYCHIATRY.—By W. S. Sadler, M.D. 1936. The C. V. Mosby Company, St. Louis. Pp. xxii plus 1231. Price, \$10.00

THIS book has probably no equal of its kind in the world. It is a truly monumental work. The author contends that the problem of mental hygiene will never be adequately solved, as regards either curative effort or preventive measures, unless the entire medical profession awakens to an interest in the increasing army of those who are afflicted with neuroticism, emotional disturbances, personality disorders, and the more serious psychoses. Dr. Sadler is a disciple of no particular 'school' of thought for, as he very truly observes, 'the well-read and progressive psychiatrist will find himself utilizing the suggestions of all schools of thought before he has been very many years in practice'. The book begins with an admirable historical survey of the development of psychiatry and psychotherapy. In his consideration of the genesis of mental disorders of any sort, the author adopts a wholly dynamic standpoint. He regards mental disorder as the outcome of an internal personal struggle wherein the resources for re-adjustment have turned out to be inadequate for the task imposed upon them. This view is, of course, one that is gaining wider and wider recognition among psychiatrists everywhere. On the other hand, Dr. Sadler's views in respect to the ætiology of mental defectiveness will evoke a good deal of criticism. Mental deficiency is not, as Dr. Sadler seems to suppose, a biological concept. It is not a single condition but a collection of conditions, hence the problem of mental deficiency is wrongly envisaged if it is regarded, as Dr. Sadler appears to do, as a problem in the inheritance of deficiency. In respect to the ætiology

of nervous disorders in children, the author seems to attach too little importance to what we have every right to regard as the cardinal factor in nervousness in children, namely, the conflict which has its origin in the anxiety that emanates from the child's attempt to find a secure 'niche' for itself in the family circle. While the author has a great deal to say on the part played by religion, i.e., Christianity, in the lives of psychoneurotics and psychotics, as well as in psychotherapy, he omits any discussion of the effects of religious instruction on the mind of the child. As regards the important subject of sex enlightenment for pre-adolescents, Dr. Sadler's views are rather banal. Surely he does not suppose that sex enlightenment can be disregarded until puberty is past? In his consideration of juvenile delinquency, no mention is made of the valuable researches of Burt in England and too little of the work of William Healy in America. One of the most engaging and informative chapters is chapter 59, entitled 'Psychiatry and psychiatrists'.

Dr. Sadler expresses the hope that some great university will one day establish and finance a 'School of Personality' which will be an institution of applied psychology and psychiatry in both preventive and curative domains. Treatment is discussed under all its aspects, psychological, pharmacological, occupational and social. The book is well supplied with case histories which illustrate every conceivable form of mental disorder. Besides the bibliography appended to each chapter, the book is provided with a general bibliography and an excellent glossary. The index is good but contains some typographical errors, e.g., 'Lying' is referred to as on pp. 537, 538, when the correct reference is pp. 337, 338. Readers who are not Americans will be startled from time to time by coming across

such americanisms as 'crack-up', 'hook-up' and 'set-up'. In a book that will deservedly reach an international circulation, these unusual terms might be well modified to suit English as spoken in Europe, Asia and Australasia.

O. B-H.

AN INTRODUCTION TO PSYCHOLOGICAL MEDICINE.—By R. G. Gordon, M.D., D.Sc., F.R.C.P. (Ed.), N. G. Harris, M.D., B.S. (Lond.), D.P.M., and J. R. Rees, M.A., M.D., D.P.H. (Camb.). 1936. Oxford University Press, London, Humphrey Milford. Pp. x plus 386. Price, 10s. 6d.

THE three distinguished authors of this book are obviously aware that the curricula in British schools of medicine are still lamentably treated as regards instruction in psychological medicine, and perhaps nowhere does this apply more than in medical schools in India. In consequence of this state of affairs, the authors have set themselves the task of attempting to remedy matters by producing a textbook on psychological medicine for medical students and no one will deny that the result of their labours is anything but praiseworthy. The book is divided into five sections. The first deals with psychological organization and the personality as a whole; the second section is devoted to psychopathology; the third to the psychoneuroses; the fourth to the psychoses and the fifth to mental deficiency. In the section dealing with the psychoses there is included a short exposition of the English law in relation to mental disorder. Perhaps more space might have been allotted to the mental disorders of childhood, particularly in respect to convulsive seizures in children. There is a limited bibliography and an excellent index. As a textbook this book should be very popular wherever the English language is employed as a medium of instruction in medicine.

O. B-H.

A MANUAL OF THE COMMON CONTAGIOUS DISEASES.—By P. M. Stimson. Second Edition. 1936. Baillière, Tindall and Cox, London. Pp. 439. Illustrated with 53 engravings and 3 plates. Price, 18s.

THIS book is intended as a clinical guide for medical students, interns and nurses working with contagious diseases. The gratifying welcome given to the first edition shows that there is a real need for such a compact and handy book. Concise and yet complete accounts are given of the common contagious diseases. The information is all up to date; for instance the newer conceptions of whooping cough and poliomyelitis vaccines, the rapid method of culturing diphtheria bacilli, and the use of placental extract in the prevention of measles are all presented.

It includes chapters on such diseases as the principles of contagion, serum reactions, common infectious diseases and general management of contagious diseases. Maladies such as the common cold, influenza, epidemic encephalitis, etc., have been excluded. Certain sections, especially that on anterior poliomyelitis, are particularly well written. The double-page chart on the various manifestations of this disease facilitates a clear understanding. Under diphtheria, the author rightly recommends the total amount of antitoxin needed be given at the first injection. In obstructed breathing, aspiration or intubation has been preferred to tracheotomy. While the risks of the latter seem to have been exaggerated, no instructions have been given regarding the nursing and management of such a case. The chapter on smallpox is a new addition. The resemblance of smallpox to a severe case of influenza has been stressed. A case of dengue with marks of mosquito-bites on the face and wrist might also require to be differentiated from this disease. The last chapter includes abstracts from the code of the Willard Parker Hospital describing the detail with which the medical aseptic technique should be worked out. Services of two nurses are required for each three patients to carry out the technique adequately. It is a question how far this would be possible in real practice.

The book is provided with a bibliography at the end of each chapter, a useful glossary and a good index followed by a summary of common contagious diseases in tabular form. There are some good photographs and diagrams, most of which are borrowed. An additional illustration showing Koplik's spots of measles would be helpful to those for whom the book is intended. The volume is well produced and clearly printed. It should prove as useful and stimulating as its precursor.

R. C.

FRACTURES.—By P. B. Magnuson, M.D. Second Edition. 1936. J. B. Lippincott Company, Philadelphia and London. Pp. xxi plus 499, with 317 illustrations. Price, 25s. Obtainable from Messrs. Butterworth and Company (India) Limited, Calcutta. Price, Rs. 18-12

THE first edition published in 1933 was reviewed in the March issue of the *Gazette* of 1934. A second edition was predicted, but with the exception of the addition of a bibliography of 32 pages the book is merely a reprint. No attempt has been made to lighten the work by weeding out x-rays which reproduce badly and the error in the line drawing on page 251 is perpetuated. It is doubtful if the bibliography adds much to the value of the book for general surgeons in India. It is certainly of no value to the specialist who requires precise references rather than a general bibliography.

H. R. R.

[We feel that we should add, for the benefit of those who have no copy of the March 1934 number of the *Gazette*, that the review (by the same reviewer) of the first edition was a very favourable one; the book was particularly recommended to junior surgeons on account of its very practical outlook.—EDITOR, *I. M. G.*]

'AURAL THERAPY IN RELATION TO DEAFNESS.'—By Professor D. F. Fraser-Harris, M.D., D.Sc., B.Sc. (Lond.), F.R.S.E. The Sterling Medical Publishing Company, London (81/3, Knight Rider Street, E.C. 4). Pp. 45, with 10 figures. Price, 7s. 6d.

IN this small brochure Professor Fraser-Harris describes in lucid language the principles of measurement of auditory acuity and the method of correcting auditory deficiencies revealed by the audiograph.

The author's illuminating articles in the *Lancet* and elsewhere have done much to stimulate and enlighten us on the subject of the different types of chronic deafness.

This is a matter of very great practical importance for if the patient adopts an ordinary microphone 'hearing aid' this merely amplifies sounds in general and not only the particular notes of the scale for which he is deaf. The use of such a microphone is not only useless but often even painful.

The audiograph designed by Dr. Balbi can identify the particular range of notes, high or low as the case may be, and then a selective amplifier can be prescribed so as to intensify the deficient notes and those only. The patient thus secures an accurate and selective form of amplification which often will give him back normal hearing.

Even if it does not prove to be quite so successful as suggested, it is a very great advance on our past methods of treating these very sad cases.

The National Institute for the Deaf, in London issues pamphlets for the patients telling them what to do and what to avoid in the matter of aids of hearing. However, this is not enough. Much more publicity is needed and more protection required to save these people from being exploited by unscrupulous manufacturers of hearing aids.

This is a very valuable little book but a larger edition is required giving much more detailed information.

H. S. C.

THE AMBLYOPIA READER: (A SYSTEM OF EYE-SIGHT DEVELOPMENT).—By Margaret Dobson, M.D. Oxford University Press, London. Pp. 93. Illustrated. Price, 15s.

It gives us much pleasure to bring to the notice of ophthalmologists working in India this excellent little book.

Amblyopia, or to give it the full name—amblyopia-ex-anopsia, is an ocular condition in which the vision is poor because of non-use of the eye and cannot be improved by lenses which correct the refractive error. The fundus oculi does not show any defect and the eye affected is undeveloped and uneducated.

Squint is a very common ocular defect in India and unfortunately cases seldom come early for treatment with a result that amblyopia is usually present in the deviating eye. This complication makes the treatment of squint by orthoptic methods all the more difficult as the image in the weak eye is blurred and hence easily suppressed. *The Amblyopia Reader* consists of stories and nursery rhymes with illustrations which have been compiled from Hamblin's stereoscopic cards, and are printed in orange and black letters and in types of different sizes.

As amblyopic eyes respond better to an orange stimulus than any other, a ruby filter is provided with the amblyopia reader so that, by covering the sound eye with this, the orange colouring is made invisible, only the black parts being seen by this eye, whilst the eye with poor vision sees the words and pictures in orange and black. Hence with the ruby-red filter applied over the better eye and employing orange and black print, the patient is made to use both eyes at the same time.

The authoress carefully explains how the book should be used. We strongly recommend this system to all medical men whose work involves refraction and the treatment of eye diseases.

E. O'G. K.

TEXTBOOK OF PATHOLOGY.—By Sir R. Muir, M.A., M.D., Sc.D., LL.D., F.R.S. Fourth Edition. 1936. Edward Arnold and Company, London. Pp. vii plus 994. Illustrated. Price, 35s.

TWENTY years ago the textbooks of pathology suitable for the student were few in number, but the problem of the teacher of to-day is not to find a suitable book for recommending to his students but to choose between the many excellent ones that are available. Amongst these, the book under review takes a very high place. It first appeared in 1924 and during the last 12 years has gone through four editions and five additional reprintings. The third edition was reviewed in this journal in February 1934. Since then there have been many additions to knowledge in this subject and these have been incorporated in the new edition. The length of the book has not however been increased and consequently judicious weeding out has had to be exercised.

The first two hundred pages are covered by the general introductory chapters on disturbances of nutrition and circulation, on inflammation, infection, and immunity; there are two chapters on tumours, and for the rest the subject-matter is divided according to 'systems', the circulatory, the respiratory, the hæmopoietic, etc. This arrangement of the matter is usual in books of this kind but it is very satisfactory. There are numerous illustrations, the majority of which are useful, but on the whole these are the weakest points in the book; some of the photomicrographs are too small and could not possibly convey to the student what they are apparently expected to convey.

The various chapters all appear to be equally good and have all been brought completely up to date. In the chapter on the hæmopoietic system the most recent work on this subject has been introduced. In this chapter there are a few pages devoted to the parasitology of malaria which are useful but seem to the reviewer to be a little out of place; the excuse for their inclusion is possibly that they provide the student

in temperate climates with all he need know about protozoology. In discussing malarial anæmia the author says, 'It may be that malaria occasionally produces the essential defect which results in pernicious anæmia'. It may be but it is very unlikely, if he is using the word 'pernicious' in the specific sense meaning 'Addisonian anæmia', as Addisonian pernicious anæmia is very rare in most malarious countries.

The format of the book is very suitable, the print is clear and the book is not particularly heavy for its size. It is a book that we can strongly recommend to the student and his teacher, and to the doctor who has not lost interest in the profession he practises it will form a useful reference book.

A TEXTBOOK OF HISTOLOGY.—By J. Krafka, Jr., Ph.D., M.D. 1936. Baillière, Tindall and Cox, London. Pp. vii plus 246. Illustrated. Price, 11s. 6d.

This book is in many ways a new departure. In the first place it is not written 'to fill a long felt want', but rather to create a demand for itself and for books of its kind. The author's object was to demonstrate how suitable histology is for inclusion in science curricula and how much more suitable than other biological subjects that he would like to see it replace. He considers that it is self-evident that the cell theory can be more rationally expounded on a background of human histology than on one of comparative anatomy.

This is an argument into which we do not propose to be drawn, but what we see here is a book on the elements of histology, written in very simple language, that could be read with advantage by every medical student before he tackles the larger textbooks on the subject and one that should provide the licentiate student in India with all that he needs for the purpose of his examinations.

There is little more that need be said. The text is illustrated throughout by line drawings, most of which are semi-diagrammatic but some are camera-lucida drawings. The one coloured plate is of blood cells in the bone marrow; it is taken from Maximow and Bloom's well-known histology and is one of the best of its kind that we know. We commend this book to the earnest attention of teachers in India, particularly to those in the smaller medical schools.

THE EMANCIPIST: AN HISTORICAL DRAMA IN THREE ACTS.—By Major-General John M. Antill, C.B., C.M.G., and his daughter Rose Antill-de Warren. 1936. Angus and Robertson Limited, Sidney. Pp. ix plus 165. Price, 3s. 6d.

THE only medical interest in this play is that the hero was a medical man and, as is claimed in the introduction, was the first medical graduate in Australia. It is hardly correct to style him a *graduate* for he received his diploma after a special examination held at his own request by certain leading doctors in the colony at the time, long before any medical schools were established there.

Redfern is a romantic character who only became a convict on account of his championing the cause of the men of the British Navy in an attempt to obtain for them the badly-needed better food and accommodation, while he was assistant surgeon on H. M. S. *Standard*. He was tried by court martial and sentenced to death, but was reprieved and imprisoned in Dartmoor and four years later was transferred to Australia at his own request. Not long after his arrival in New South Wales he was lucky in attracting the attention of the authorities so that he was given medical work to do instead of the monotonous manual labour that was the lot of practically all convicts. He worked so well and successfully that he was finally granted a free pardon and became one of the principal doctors in Sydney even attending the wife of the governor, Macquaire; at the same time he acquired considerable property and married the daughter of one of the leading colonists. After making his mark in the young colony in the early years of the nineteenth century Redfern finally

returned to Great Britain with his family and left no direct descendants to carry on the good work he had begun in assisting the development of early Australia. The authors of this play, however, are connections of his by marriage.

The above story is well told in the play under review though it is perhaps a little longer in some scenes than is necessary. It will be of special interest to Australians on account of the glimpse it gives of life in New South Wales in the early days and is thus of considerable historical value. In other parts of the Empire it should serve a useful purpose by indicating that by no means all the convicts sent to Australia at that time were criminals in our modern sense, but were often reformers who, unfortunately for them, lived at a time when their efforts, then frowned on by authority, would in later years possibly have earned them decorations and honours instead of imprisonment and transportation.

P. A. M.

BRITISH MASTERS OF MEDICINE.—Edited by Sir D'Arcy Power, K.B.E., F.R.C.S., F.S.A. 1936. The Medical Press and Circular, London. Pp. xv plus 242. Illustrated with 32 plates. Price, 7s. 6d. (Obtainable from Messrs. Baillière, Tindall and Cox, London.)

THIS collection of essays on British masters of medicine will form a valuable addition to any medical library. The essays are all written by well-known British medical men of the present day, some of whom will possibly find their way into future volumes of the same nature, unless the time for individual 'masters' has now passed. The subjects of the biographies range, historically, from Harvey to Starling; all the familiar historical names are there and about half a dozen are those of men who died during the present century. It is surprising how rapidly a name does become 'historical'; it came as a great shock to the reviewer to be reminded that Manson died only 14 years ago and Lister within the last quarter of a century.

An original feature is the inclusion of Sir John Floyer as a 'master'. His case appears to be a strong one and it is a little surprising that we hear so little about him. He is described as a hydrotherapist, but his revival of this practice was only one of his contributions to medicine of his day (1649 to 1734) and certainly not the most important. His greatest claim to fame was his revival of the study of the pulse and particularly his introduction of a one-minute watch for counting the pulse and the respirations. His contributions to medical literature were very numerous and contained many original ideas which were not always well expressed. He excused his literary short-comings by 'I having no health to transcribe what I have writ'. However, his

health seems to have been good enough to carry him through 85 years of life, and he set a bad example which is followed to the present day; medical writers abound who think that they have a message to deliver to the world but will not take the trouble to put it into an understandable form and write it in grammatical, much less polished, English.

The cover of the book is particularly suitable for this country as it is of unvarnished cloth which presents no temptation to cockroaches. The print is clear and with each biography there is a photograph of the 'master'. It is a book that we can recommend to the physician for pleasant and profitable reading.

L. E. N.

PLAGUE: A MANUAL FOR MEDICAL AND PUBLIC HEALTH WORKERS.—By Wu Lien-Teh, M.A., M.D., J. W. H. Chun, M.B., B.S., R. Pollitzer, M.D., and C. Y. Wu, M.B., B.S. 1936. Published by Welsheingshu National Quarantine Service, Shanghai Station—China, R.C. 25. Pp. xxxiii plus 547, with 103 illustrations, of which 6 are in colour. Price in China:—C.S. \$10.00. Price abroad:—15s. or U. S. \$4.00

THIS is a survey of practically all that has ever been written, said, or thought, up to date, on the subject of plague from every possible aspect, even the Pakur murder case has its niche. The distinguished authors do not set out to vaunt any *nostra* for the matters on which they separately write, they simply triturate all the available pabulum in the gizzards of their cold logic before presenting it to the public, in a series of clinical and epidemiological chapters.

Everyone who has anything to do with plague in India should have this splendid résumé of the subject on his bookshelf.

C. S.

MATERIA MEDICA INCLUDING PHARMACOLOGY AND THERAPEUTIC HINTS.—By S. Chatterjee, B.Sc., M.B. 1935. Published by The Medical Publishers, Calcutta (44, Kallias Bose Street). Pp. viii plus 391. Price, Rs. 4 or 6s. 6d.

THIS small book has been written with the object of presenting the elements of materia medica to the student, not only for examination purposes but also as a handy book of reference. The main body of the book deals with the common drugs and their composition, preparation and pharmacological action. In every instance their therapeutic uses are given. Sections are included on gland extracts, vaccines and antitoxins. The presentation of the subject is excellent and up to the mark.

J. C. G.

Abstracts from Reports

INTERIM REPORT OF THE MIXED COMMITTEE ON THE PROBLEM OF NUTRITION. LEAGUE OF NATIONS. (INDIAN BUREAU.) BOMBAY

THE FOOD OF THE WORLD

THE appearance of the first volume of the four-volume study entitled 'The Problem of Nutrition' marks an important stage in the League's effort to place at the disposal of public health authorities, sociologists, producers of foodstuffs and citizens of every country, the important discoveries of science about the relation between diet and health. Two discoveries have revolutionized modern thinking about health and disease: that of the importance of at least nine vitamins, and in particular the so-called 'protective' vitamins, to the maintenance of good health; and that

of the essential connection between the healthy growth and functioning of the human body and some twelve inorganic mineral elements. Not merely in the more obvious case of 'deficiency diseases' is a properly balanced dietary now recognized as the essential remedy. It has become clear that only if this is maintained can good health be assured in the individual who appears to be free from organic disease; and that the diet of the pregnant mother gives the child its start in life, either with a well-balanced organism or a handicapped physique.

A dreary state of sub-health

Recent surveys of food consumption have revealed the fact that thousands enjoying a quite adequate income do not know how to employ it to the best advantage in buying food, while in every country there

are throngs of people living out their days in a dreary state of sub-health, without energy or spirit, because they lack either the means or the knowledge to remedy this condition.

The remedy—adapt production, and teach food values

It is true that scientific discoveries applied to agriculture, by strengthening man's power over nature, are enabling him to increase the production of foodstuffs beyond all previous calculations. He has still, however, to discover how to place within the reach of low and average incomes the foods essential to health. The world to-day presents the paradox of the simultaneous existence of underfed masses of people on the one hand, and of a surplus of agricultural production on the other. Economic depression and unemployment have seriously impaired the ability of millions to procure a sufficient quantity of wholesome food. But the crisis did not create this problem: it only emphasized and brought to light a condition tragically chronic.

In every country the observer finds lowered vitality, diminished resistance to disease and deficiency diseases themselves, even in districts where the standard of living in other respects does not appear to have been greatly impaired. The problem is therefore not merely one of economic organization, but also one requiring popular instruction about the character and value of available foodstuffs.

The dietary of its people has become a major national problem for every Government—a problem which will require for its solution not merely the application of new discoveries about the nutritive value of different foods, but the consideration of national, social, agricultural and economic policies from the point of view of national food requirements. Governments have been impelled to approach the problem, first, through realization of the serious dangers latent in the present position, second, by the promise held out by modern agricultural methods for the adaptation of foodstuffs to improve the people's standard of living and well-being.

It was recognition of the gravity and complexity of this problem for the world that led the League Assembly in 1935 to set on foot an enquiry into the problem of nutrition in relation both to public health and to economic conditions.

The mixed committee of the League of Nations on nutrition

The mixed committee of the League on nutrition has held two meetings since the last Assembly and has prepared for consideration at the forthcoming session of the Assembly the four volumes of its Interim Report.

Volume I is the report proper, embodying the suggestions made by the mixed committee to the Assembly, and giving a general idea of the problems involved.

Volume II, *Report on the physiological bases of nutrition*, contains a report drawn up by the Technical Commission of the Health Committee. This Commission first met in London in November 1935. The conclusions at which it arrived were submitted to the first session of the mixed committee and formed the starting point of its consideration of the scientific aspect of the nutrition problem. This is now presented in a revised and amplified form as a result of a meeting held by the Technical Commission in June 1935.

Volume III, *Nutrition in various countries*, gives the substance of the actual data received by the committee, including the essential portion of the information contained in the replies of certain Governments to the Secretary-General's circular letter of 30th November, 1935. It also contains a survey of developments in popular diets in a number of countries since the War. In addition, there will be found in this volume the report of the sub-committee appointed by the mixed committee to examine the available statistical material concerning the consumption of foodstuffs.

Volume IV, *Statistics of food production, consumption and prices*, a document prepared by the International Institute of Agriculture, which contains

valuable material assembled by that Institute at the request of the mixed committee, reviewing the available statistics of food production, consumption and prices.

Contents of volume I

Volume I contains a general survey of the nutrition problem, and the conclusions arrived at by the experts. The authors draw attention to the manifest evidence of inadequacy of diet in many parts of the Western world. They point out that scientific research has revealed the fact that there does exist an optimum standard of human diet, and devote a chapter to explaining the principles of adequate nutrition in terms of the different foodstuffs easily available in the West. The function of the different vitamins and the foods in which they may be found are set out. There is also a detailed consideration of the special dietary needs for different classes and age groups—expectant and nursing mothers, infants, children of pre-school age, children of school age, youths and adults.

'Minimum standard' of human diet

The report goes on to reproduce the minimum standard of human diet adopted by the Technical Commission of the Health Committee in November 1935. The standard is discussed under two headings: (1) the foods essential for their energy, protein and fat content; (2) those essential for their mineral and vitamin content. The commission adopted its standard for various types of people—adults, adolescents and children—by first fixing a basic figure to represent the requirement for normal maintenance and growth. To this was added the supplements required in the special cases studied—for heavy work, or for growth (in the case of children), or for pregnancy and lactation. The authors of the standard diet laid particular emphasis upon the need for 'protective' foods—milk, butter, cheese, eggs, meat, potatoes, fresh green vegetables and fresh fruit. The nutritive value and mineral content of each of these is analysed at some length.

Milk, oranges, and the rescue of the potato

Milk is an essential in the human dietary. 'The use of milk in the diet of the human race is as old as the history of mankind. A land flowing with milk was the ideal of pastoral tribes in ancient times, and will still remain the ideal, if the correct nutrition and health of the people receive due consideration'. The fine physique and stamina of the Arabs and other races inhabiting South Western Asia and South Eastern Europe, where milk has always had an important place in the diet, are referred to as evidence of its nutritive qualities. Indeed, 'milk is the nearest approach we possess to a perfect and complete food, and no other single food is known that can be used as a substitute'.

Citrus fruits, and in particular oranges, are an important food which have not in the past been made sufficiently available to those living within low or moderate incomes. This is pointed out as a case in which a change in commercial policy would immensely benefit the dietary of people living in countries where citrus fruits are not grown.

The report points out various fallacies which have resulted in malnutrition. 'Slimming' in adolescents or young adult people has been responsible for lowered vitality and decreased resistance to disease, in particular to tuberculosis. The potato, whose popularity has suffered from the fashion for slimming, is revealed as a food, 'rich in calories and in starch, and is particularly suited to substitute sugar and cereals in the modern European diet'. Districts which have a known relatively high consumption of potatoes have been found to be singularly free from dental disease.

Economic considerations—income, marketing organization, social assistance

The report refers to a study issued in June 1936 by the International Labour Office entitled 'Workers' nutrition and social policy', in which the problem of adequate nutrition for workers living at different income

levels is examined. The Labour Office report concludes that 'the question of income is at the root of the workers' nutrition problem'. The problem of how to ensure to its citizens the food adapted to their various needs is the natural responsibility of every Government. International co-operation, however, is also indispensable in order that efforts to improve nutrition in the various countries may be made in harmony with the needs of world economy.

At this point the report embarks upon its consideration of the economic aspects of the nutrition problem. The 'protective' foods, of which a generous supply must be ensured in the interests of a good dietary, are relatively costly. 'It is thus clear that the improvement of nutrition is associated with the maintenance and improvement of the general level of income', but a first step may be taken without effecting any far-reaching changes by better organization of supplies and by widespread education with regard to the value of commonly available foods. Further, 'the level of food prices must depend primarily on the operation of agricultural and trade policies'. The public authorities may, however, bring the supply of essential food products within the reach of the low-income and impoverished sections of the community by various forms of direct action. Moreover, 'there is a vast field for activity in the attempt to promote better market organization and to bring producer and consumer in close contact'.

If poverty is the main cause of malnutrition, schemes of public assistance must take this into consideration. 'When public assistance is afforded and can act by means of price privileges, it is of the greatest importance that it should be guided by sound nutritional precepts and that those foodstuffs should be selected of which the lack is most serious. The case of milk deserves special attention in this connection'.

The report contains a chapter on malnutrition among agricultural populations, and considers the question of whether agricultural practice can be adapted to meet the new requirements of better nutrition so that those engaged in agriculture may themselves enjoy a good dietary.

Recommendations to Governments

So far as the health aspects of the problem are concerned, the committee suggests that the Assembly should recommend to Governments that they should promote the scientific study of nutrition problems and see that the latest information on nutrition is included in the teaching of medical students, public health authorities, etc.; that they should conduct a vigorous policy of education and propaganda for the instruction of the general public and facilitate international co-operation and the exchange of information in this field; that they should support the work of the League Health Organization on this subject; that they should consider the steps to be taken, whether at the public charge or otherwise, to meet the nutritional needs of the lower income sections of the community, in particular as regards ensuring adequate food supplies, especially safe milk, for expectant and nursing mothers, infants, children and adolescents, and the needs of unemployed or other distressed adults; that everything possible should be done to make food supplies, especially protective foods (e.g., milk, eggs, fresh vegetables), available at prices within reach of all classes of the community, while at the same time safeguarding the interests of the producers.

For these purposes, it is therefore suggested that Governments should improve and cheapen the marketing and distribution of foodstuffs in both industrial and rural districts; that they should encourage collaboration between co-operative and other forms of producers' and consumers' organizations; that they should grade foods of all kinds according to quality, safeguard the purity of foodstuffs, and control, on the basis of international standards, the preparations sold primarily for their vitamin content, co-ordinate the work done by different national authorities under a

central authority and co-operate internationally, as well as consider any modification of their general economic and commercial policies that would help to secure the supplies of foodstuffs necessary for a sound nutrition policy.

The mixed committee also invited the Assembly to recommend the Governments concerned to give their full support to the Health Organization in its enquiries into the widespread malnutrition which exists in the tropics and certain Far Eastern countries.

KING GEORGE THANKSGIVING (ANTI-TUBERCULOSIS) FUND

ANNUAL REPORT, 1935

THE King George Thanksgiving (Anti-Tuberculosis) Fund is the nucleus of anti-tuberculosis activities in India and represents the national effort to fight tuberculosis. The fund would enlarge its scope of work if money were available, but with its limited resources its activities have to be restricted. At present we direct our energies to bringing home to the public the necessity and urgency of the problem. We have set ourselves to organize a propaganda and educative campaign in the Provinces of British India as well as in the Indian States with a view to educating the people about the causes and preventive measures against tuberculosis, and to create a public conscience so that efforts may be made in all directions to fight the disease. The anti-tuberculosis committees appear to have quickly won the sympathy of the people and become popular for the following reasons:—

1. The object and scope of our work is specific, well defined and limited.

2. Tuberculosis is such a common disease that practically every urban adult has a personal knowledge of a case or death and has seen the consequent misery.

3. The problem of tuberculosis is most acute in cities and towns where the medical officers of health and prominent members of the municipal committees and corporations are anxious to help the cause.

We have now 16 provincial and state anti-tuberculosis committees and have the fullest co-operation of medical, public health and education departments, sanatoria, medical colleges and schools throughout India. Our activities are spreading and need growing.

The year 1935 was marked with the Silver Jubilee Celebrations of Their Majesties, the King-Emperor and the Queen. The Indian Red Cross Society was one of the beneficiaries from the Silver Jubilee Fund which was inaugurated by His Excellency the Viceroy to commemorate the occasion for the relief of sickness and suffering throughout India. The Indian Red Cross Society, out of its share, has allotted Rs. 86,000 to our fund. The money will be added to the capital to make good the loss in income which decreased by about Rs. 3,000 owing to the necessity of converting the Government securities, in which the fund was vested, from short-dated stocks yielding a higher rate of interest to long-dated ones yielding lower rates. The anti-tuberculosis work has always been recognized as one of its important activities by the Red Cross and the promotion of this work was referred to in several provincial appeals issued in connection with the raising of the Silver Jubilee Fund.

During the month of February, Dr. A. R. Mehta visited Calcutta in connection with the post-graduate course for special training in tuberculosis. In addition to making arrangements for the course and looking after the class, he delivered lectures on the following subjects: 'The object and scope of the fund', 'The rôle of a private physician in the control of tuberculosis', 'Specialized organizations in the prevention of tuberculosis' and gave tutorial talks on allied subjects. On the way back from Calcutta he visited Nagpur to revive the anti-tuberculosis committee. Here he addressed the managing body of the Provincial Red Cross Society, organized a committee and

had discussions and gave suggestions to the municipal, medical and public health authorities.

In March Dr. Mehta toured in the United Provinces. He visited Lucknow, Agra, Cawnpore, Allahabad and Benares where he addressed several meetings, met the public health and medical authorities and brought to their notice the urgency and need of tuberculosis control and the ways and means to fight the scourge.

In May the organizing secretary attended the opening ceremony of the Red Cross Jubilee Sanatorium, Samli (Rawalpindi district), which is the result of the efforts of Mr. and Mrs. King.

In the end of July Dr. Mehta again left on tour and visited Delhi and Calcutta and toured in the provinces of Bihar and Orissa and Assam. During the months of November and December the organizing secretary toured in the Madras Presidency and Cochin and Travancore States.

Publicity and propaganda.—A large amount of propaganda material on tuberculosis published by the fund was issued during the year. The coloured picture posters on causes and prevention of tuberculosis, which were first published in 1933 and reprinted in 1934, have proved very popular and have been in great demand. Five thousand copies each of these posters were reprinted during the year. These were also reproduced in small size in a leaflet form, 'Our posters', and 5,000 copies were printed and issued free of cost. The following pamphlets were also reprinted during the year:—

1. 'Prevention of tuberculosis' (3,000 copies).
2. 'Prevalence and causation of tuberculosis' (3,000 copies).
3. 'Home treatment of tuberculosis' (5,000 copies).
4. 'Why does tuberculosis "run in families"?' (5,000 copies).
5. 'Tuberculosis infection' (5,000 copies).

The fund's own film on *Causation and prevention of tuberculosis* and other tuberculosis films have been in constant demand and were shown at various places in different parts of India. The slides on tuberculosis stocked by the fund for sale were also issued on loan and some were presented to honorary workers for anti-tuberculosis propaganda work.

Propaganda cinema lorry.—The travelling cinema lorry fitted up at headquarters for anti-tuberculosis propaganda work started touring in March. It is fully equipped with a standard size projector, a Homelite generating set, films and literature and there is a qualified medical lecturer attached to it. The lorry toured in the Punjab from 26th March to 19th May. It left headquarters on 2nd December for tour in Ajmer-Merwara, Rajputana States and Central India.

The visits of the lorry created great interest and enthusiasm among the public in the anti-tuberculosis problem and the cinema shows and lectures attracted large audiences at all the places. Handbills on tuberculosis were distributed free by the lecturer in charge of the lorry and a good deal of propaganda literature was purchased by people on the spot. In addition to these tours, the cinema lorry was utilized for various local shows and exhibitions.

Training of tuberculosis workers.—It is one of the important duties of the fund to improve the knowledge of medical practitioners in diagnosis, treatment and prevention of tuberculosis so as to equip them with the up-to-date methods of fighting the disease. With this end in view, a special training course in tuberculosis was organized by the fund at the All-India Institute of Hygiene and Public Health, Calcutta, from 4th to 23rd February, 1935. The class was limited to 25 candidates only, as this was considered to be the maximum number that could be handled effectively for demonstration and clinical purposes. The selection of candidates was made on a territorial basis by the headquarters committee from amongst private practitioners and those belonging to the medical and public health departments. The session started on the 4th February and the classes were held from 10 a.m. to 4 p.m. every day. The programme of the course covered various

aspects of the tuberculosis problem. The course was acclaimed by all to be an unqualified success. The fund defrayed the railway fares of all the selected candidates who attended the course. The committee is grateful to all those who co-operated in making the course a success.

In view of the keen demand for such courses, the committee has decided to hold another in 1936 in Calcutta. The selection of candidates for this course has also been made and it will be held from 6th to 31st January, 1936. The possibility of holding such courses in Lahore, Madras and Bombay is also being explored.

The Tuberculosis Association of Bengal has been in existence since 1929 and in 1934 maintained six tuberculosis dispensaries—four in Calcutta, one in Howrah and one in Krishnagar. Forty-four thousand, five hundred and ninety cases were examined at these dispensaries during 1934 out of which 2,292 were found to be of pulmonary tuberculosis. Eighteen thousand and eighty-one home visits were paid and 1,134 contacts were examined out of which 304 were found to be suffering from tuberculosis. The association enrolled 5 life and 85 annual members and raised over Rs. 35,000 which includes a grant of Rs. 10,000 from the Bengal Government and Rs. 4,000 from the King George Thanksgiving (Anti-Tuberculosis) Fund headquarters. The expenditure amounted to Rs. 32,000. The association has done admirable work and set a very good example as to what a voluntary organization can achieve in the fight against tuberculosis.

ANNUAL REPORT OF THE ROYAL COLLEGE OF PHYSICIANS OF EDINBURGH BY THE CURATOR OF THE LABORATORY FOR THE YEAR 1935

Antirabic treatment.—A sixth analytical review of the results of antirabic treatment at the various Pasteur Institutes of the world, which submit statistics to the League of Nations, has been prepared by the Superintendent.

The statistics relate to 118,062 persons—treated mainly during the year 1933—of whom 408 died of rabies in spite of treatment. The total statistics dealt with in the six reviews relate to a total of 524,258 persons, of whom 2,076 (0.40 per cent) contracted the disease. It appears that the mortality amongst 286,373 Europeans was 0.16 per cent, and that the rates for the different methods of treatment did not significantly vary from this, and that, in the case of 219,681 non-Europeans, the mortality rate was 0.72 per cent, and again this figure did not appear to be influenced by method of treatment. It may at first sight seem surprising that figures amounting in all to about half a million are insufficient to demonstrate significant differences in the efficiencies of the various methods of treatment. The controlling factor is the mortality rate; the lower this is, the greater the number of patients required to demonstrate significant variations. All that can be said at present is that the figures so far available are not yet sufficient to demonstrate the existence of differences of efficiency of less than 25 per cent; and, conversely, that it is unlikely that a difference between the efficiencies of any two methods of treatment of magnitude greater than 25 per cent exists.

The statistics relating to antirabic treatment in the U. S. S. R. for the year 1933 have not yet been received.

Histopathology.—Routine examinations and reports are still increasing in number and show little sign, in the present year, of any tendency to grow less. These amounted in 1935 to a total of 3,977, which is an increase of 329 over that of the previous year. The value, from the point of view of research, of these routine examinations is that increasing experience is gained in the framing of judgments of malignancy. Altogether 1,209 tumour growths were reported upon during the year. The total collection comprises, to the date 31st December, 1935, eleven thousand, six hundred

and thirty tumours, and this represents entirely primary or secondary tumours, exclusive of their extensions to other organs. Breast tumours number 1,229, tumours of the nervous system 397, and tumours of the skin 1,551. Other localities furnish tumours in lesser or greater degree. Altogether there is a wealth of material available which would repay systematic study.

During the year 1935 an investigation of the tumour carcino-sarcoma was completed and published. The full illustration of this paper was rendered possible by a generous grant from the Carnegie Trust. In this study the position was maintained that these two entirely separate malignant tumour types could coexist, but that the primary and predominant partner in their simultaneous occurrence was the cancer proper. In explanation of this phenomenon the possibility of the mimetic tumour was fully considered, as also was the reaction of surrounding tissue to cancer invasion with the elevation of that reaction to complete or nearly complete malignant tumour rank. It is possible that the latter of these alternatives would be the one preferred by most pathologists, and it was so far adopted by Col. Harvey and Mr. Hamilton in their adherence to a view which has had many supporters; namely, that reactive tissue may by continuous stages acquire malignancy.

Diseases of industry.—A research is now in course of completion, which has for its object the investigation of blood changes, which might indicate that the trade process of 'glazing' involved risk to the worker. In this process the lead or other constituent is presumed to be rendered innocuous to the worker by being in an insoluble form.

Blood examination standards.—A full demonstration of the technique of blood examination was given recently by Lieut.-Col. W. F. Harvey and Mr. T. D. Hamilton to the local branch of the Tropical Society of Medicine. The general idea from the point of view of research in the laboratory is to establish the degree of validity of blood tests, to illustrate their diagnostic or prognostic importance, and to provide something of the nature of blood standards which are based on sufficiently large numbers to justify their being considered as truly representative.

Pathology of the mamma.—Paget's disease of the nipple is being made the subject of special study, and the material collected has now reached considerable proportions. The origin of this interesting tumour is greatly debated; it is a cancer, but whether arising originally from within the breast or from the skin over the breast must form the subject of discussion. This discussion must take into account what are called the dyskeratoses, the intra-epidermal cancers and the clinical conditions named Darier's disease and Bowen's disease.

A further problem which is receiving consideration is that of the transition from the benign tumour to the invading malignant type. A simple fibro-adenoma of the breast may take on such a character, and in the material available for study evidence is found of a continuous gradation from the benign, through the 'suspicious', to the malignant tumour. The malignancy in this case results in the formation of a sarcoma and not a carcinoma.

Bacteriology and parasitology.—Routine work left little time for research, which has been devoted mainly to the study of certain species of filaria. A study is being made of the causes of the condition known as calabar swellings, which is generally believed to be produced by the presence of filaria loa loa in the tissues. It has been shown that in many cases the filaria present in the patient's blood was not loa loa but filaria perstans. Other interesting points in connection with the disease have been revealed and are at present being studied.

Chemotherapy.—Research in synthetic chemotherapy is being continued. In February Dr. Wight received an appointment in the British Research Association for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades, and in consequence was obliged to break off his

work on chemotherapy. He had carried out a considerable number of preliminary experiments in order to explore the possibility of conveniently synthesizing compounds of atabrin or plasmogine type but containing some other aromatic heterocyclic nucleus in place of quinoline or acridine. In particular he had studied the synthesis of compounds in the quino-quinoline and pyrido-quinoline series. Certain unexpected difficulties were encountered, and in consequence of the short time available the work has not so far led to any positive results, but it is being taken over by Mr. R. R. Goodall, who has succeeded to the grant from the Department of Scientific and Industrial Research, previously held by Dr. Wight.

He first of all prepared certain compounds resembling atabrin but differing from the latter in containing a somewhat different side chain. These did not show activity, and so attention has now been concentrated on the introduction of various substituents into the acridine nucleus. A number of new bases have been prepared carrying various substituents, more especially halogen. It has been confirmed that, in compounds of the atabrin type, the chlorine atom is of great importance, though a slight activity is reported for the compound in which this is absent. In the course of this work some observations of interest from a chemical point of view have been made on the chlorinating action of phosphorus pentachloride on certain derivatives of diphenylamine-2-carboxylic acid. When these compounds are treated with phosphorus pentachloride in boiling chlorobenzene solution a new chlorine atom is introduced into the muscles. This direct chlorination by phosphorus pentachloride appears to be somewhat novel.

Calcium deposits.—In the year 1833 the famous colloidal chemist, Thomas Graham, discovered a salt, now recognized to be a complex metaphosphate, which possessed the remarkable property of dissolving insoluble calcium precipitates.

In recent years a preparation of this salt, sodium hexametaphosphate, has been put on the market under the name of calgon. This substance, which dissolves readily in water to form a neutral non-poisonous solution, has been used for removing insoluble calcium salts, such as calcium carbonate and calcium phosphate, from boilers.

It seemed of importance to ascertain to what extent it could be used to remove, or at least to prevent, the formation of calcium deposits or stones in the bladder and kidneys. Though there is no doubt about the power of the compound to dissolve inorganic calcium salts, it appears, unfortunately, that the calcium deposits found in the bladder and the kidneys are particularly resistant to solution—a fact which may be due to the presence of organic matter in close association with the calcium salts and protecting the latter. Attempts to prevent the formation of the deposit are rather more promising. During suprapubic drainage, trouble is frequently encountered due to such deposits forming in the bladder and round and within the tube. It is hoped that constant washing with calgon solutions of a suitable strength will materially reduce the amount of the deposit formed. At the same time some animal experiments have been carried out on the effect of injecting calgon into the blood serum of sheep and rabbits. In order to elucidate the somewhat dramatic effects which ensue during the first 15 minutes after injection, a method has been worked out for the estimation of calgon in blood. This presented considerable difficulty in view of the tendency of the compound to be absorbed on protein precipitates.

BENGAL PUBLIC HEALTH REPORT FOR THE YEAR 1934. BY R. B. KHAMBATA, D.P.H., DIRECTOR OF PUBLIC HEALTH

The provincial birth and death rates.—Calculated on the census of 1931, the provincial birth rate for 1934 is 29.3 per mille and the death rate is 23.6 per mille as against 29.5 and 24.0, respectively, in 1933. Contrary to the previous year, the birth and the death rates of

1934 both showed a decrease, the former by 0.68 per cent and the latter by 1.7 per cent. Against the quinquennial average of 27.2 birth rate and 21.9 death rate per mille, both the birth and death rates of 1934 showed an increase of 7.7 per cent each.

Smallpox.—Eight thousand, two hundred and ninety-six deaths were due to smallpox in the province in 1934 against 15,426 in 1933, yielding a death rate of 0.2 per mille against 0.3 in 1933 and 0.3 the mean of the previous five years. There was, therefore, 33.3 per

Comparison of the Bengal vital statistics with those of the other provinces

Provinces	Birth rate per mille of population for the year 1934	Death rate per mille of population for the year 1934	Rates of natural increase + or decrease—per mille, 1934	INFANT MORTALITY RATES PER MILLE CALCULATED ON THE NUMBER OF BIRTHS REGISTERED DURING THE YEAR 1934		
				Male	Female	Total
Bengal Presidency	29.3	23.6	+ 5.7	195.6	182.4	189.2
Madras Presidency	36.17	24.95	+ 11.22	203.44	181.40	192.68
Bombay Presidency	35.79	25.42	+ 10.37	174.82	159.35	167.37
United Provinces	36.74	26.75	+ 9.99	191.94	176.45	184.64
Punjab	40.01	27.70	+ 12.31	192.35	181.85	187.40
Central Provinces	44.80	37.22	+ 7.58	268.22	237.84	253.47
Bihar and Orissa	33.7	26.0	+ 7.7	159.4	139.9	149.9
North-West Frontier Province ..	30.83	21.06	+ 9.77	137.08	130.67	134.29
Burma	30.22	20.62	+ 9.60	231.75	206.53	219.30
Assam	30.62	19.64	+ 10.98	174.11	155.96	165.30

As in the previous year, Bengal recorded the lowest birth rate but her death rate was lower than that of all other provinces excepting Assam, Burma and North-West Frontier Province. The rate of natural increase was 5.7 compared with 5.5 per mille in 1933. The infant mortality rate was lower than that of Madras, Central Provinces and Burma but higher than that of all other provinces. The provincial rate of infant mortality which had showed an alarming rise in 1933 was reduced by 5.4 per cent in 1934.

Natural increase of population in Bengal.—There was an increase of 287,633 births over deaths in the province in 1934 against an increase of 276,059 births over deaths in 1933.

Provincial deaths and death rates.—During the year 1934, 1,176,887 deaths are registered in the province, yielding a death rate of 23.6 per mille from all causes. The corresponding figure for the year 1933 is 1,197,885 or 24.0 per mille and 21.9 during the previous quinquennium. The death rate of 1934 showed a decrease of 1.7 per cent as compared with that of 1933. It increased by 7.8 per cent as compared with the previous quinquennium. 610,731 males and 566,156 females died during the year as against 613,770 males and 584,115 females during 1933. One hundred and seven males died to every 100 females.

STATE OF PUBLIC HEALTH IN THE PROVINCE AND THE HISTORY OF CHIEF DISEASES

Cholera.—Cholera took a toll of 50,742 lives from Bengal in 1934, against 29,242 in 1933. The death rate from this disease in 1934 was 1.0 per mille against 0.6 per mille in the previous year, showing an increase of 66.7 per cent.

It was 9.1 per cent less than the average of the previous quinquennium (1.1). 4.3 per cent of the total provincial deaths in 1934 was due to cholera. Reports of cholera deaths were received from 602 out of 673 circles of registration and from 10,436 out of 86,360 villages in the province, against 527 out of 672 circles and 7,897 out of 86,360 villages, respectively, in the previous year.

In January 1934, there was 1,912 deaths from cholera. The mortality rose up to 6,473 in April. It fell to 919 in September. From October it flared up again till it rose to its maximum (11,702) in December. Compared with 1933, the death rates from cholera were lower from January to April, but higher in all the remaining months. Compared with the previous decennium, the death rates were higher in July and December, but lower in all other months, except in June and November in which the annual rate was the same as in the decennium.

cent reduction in smallpox mortality in 1934 compared with the previous year as well as the previous quinquennium. Smallpox accounted for 0.7 per cent of the total provincial mortality against 1.3 per cent in 1933. Four hundred and forty-four registration circles and 2,265 villages were affected with smallpox in 1934 compared with 502 circles and 4,389 villages in 1933.

With 806 deaths in January 1934, smallpox was on a steady rise to its maximum (1,597) in April. From May, it tended to decline reaching its lowest in October. In November, the mortality was the same as in the previous month. From December, it again began to rise. The highest mortality rate (3.2 per 100,000) occurred in April and the lowest (0.2 per 100,000) in September to November. Compared with 1933 and the previous decennium, the death rate in 1934 was lower in every month, showing an unusually abrupt descent from its cyclic course.

Plague.—In Bengal, only one death from plague occurred in the town of Howrah in April 1934.

Fevers.—There were 764,492 deaths from fever in Bengal in 1934, with a death rate of 15.3 per mille, against 812,393 deaths with a death rate of 16.3 per mille in 1933 and 14.6 per mille during the last quinquennium. The fever death rate during 1934 thus decreased by 6.1 per cent, compared with the previous year, but showed an increase of 4.8 per cent over the last quinquennial average. Compared with 1933, there was a general decrease of the death rate from all kinds of fevers in 1934, except kala-azar, in which there was an increase of 7.4 per cent. Fevers accounted for 64.9 per cent of the total provincial mortality against 67.8 per cent in the previous year.

Malaria.—The deaths from malaria in 1934 numbered 387,191 with a death rate of 7.8 per mille, against 413,922 deaths with a death rate of 8.3 per mille in 1933. Malaria, like most other diseases, in 1934, was less severe inasmuch as there was a decrease of 26,731 deaths with a corresponding fall of 6.0 per cent in the death rate. Nevertheless, it claimed 50.6 per cent of the total fever mortality and 32.9 of the total provincial mortality against 50.9 and 34.5 per cent, respectively, in 1933.

Quinine consumption.—8,589.1 pounds of quinine was consumed in 1934, against 13,329.4 pounds in 1933. All the districts of Bengal showed a marked reduction in quinine consumption, but only three districts (Dacca, Tippera and Bakarganj) showed increase in fever indices. As in the previous years, Chittagong topped the list in average quinine consumption.

Kala-azar.—Kala-azar accounted for 14,763 deaths in 1934, with a death rate of 0.29 per mille, as against 13,447 deaths with a death rate of 0.27 per mille in 1933.

Jalpaiguri Duars to find out the vector of malaria in the locality and the seasonal infectivity rate, continued its work during the year under review. Two thousand, five hundred and seventy-four mosquitoes of 18 different species from nine different tea estates were caught. Of these a total number of 1,740 mosquitoes of 12 different species could be dissected. Only *A. philippinensis* and *A. minimus* were incriminated as carriers in the area during 1934. The former species was found infected during the month of October only, and the infectivity rate was found to be 14.28 per cent. The latter species (*A. minimus*) was found infected throughout the year with an infectivity rate varying from the lowest in January (1.09 per cent) to the first peak in June (14.05 per cent), then to the maximum in October (15.10 per cent).

Anti-malaria scheme for rural areas with quinine and plasmochin.—This scheme, started in April 1933 in the Burdwan district, was continued during the year 1934 which was unfortunately a year of unusual drought. Besides the thirty treatment centres opened for the purpose, local volunteers were engaged for each village to distribute combined tablets of quinine and plasmochin among the malaria patients. Attendance of patients at the centres having lessened, the doctors in charge were released to trace new cases and to follow up the treatment of patients begun by the volunteers. This method was continued till the end of June. From July the same centres were reopened and the former duties resumed. The collaboration between the centres and the volunteers was maintained through the intermediary services of six sanitary assistants deputed for the purpose for nearly three months and a half by the Burdwan district board.

The results of this experiment as far as it has gone may be summarized as follows:—

(i) In the experimental area there was no rise in the fever incidence in October over that of August but, in the outside area, it showed the usual rise in October.

(ii) During 1934, malaria in the experimental area was at least 50 per cent less than that in the control area.

(iii) The average rate of attack from malaria in the villages of Bokar, Jakra and Basatpur in the control area was 31, 33, 35 and 30 per cent in the months of August, September, October and November, but it was only 14, 12, 12 and 10 per cent during the same months in the villages of Parhati, Kanpur and Kasiara of the experimental area.

(iv) The average rate of infection with malaria parasites amongst children in the control area was 30 per cent against 18 per cent in the experimental area.

(v) The seasonal variation of malignant tertian malaria in the experimental area is far less than that in the control area.

(vi) Statistics of the children population who were born after April 1930 in certain villages of both experimental and control areas showed that, while the chance of getting fever in any one month from August to November 1934 was 17 per cent in the former area, it was 62 per cent in the latter.

Free quinine distribution through union boards.—During the year 1934, the distribution of quinine under the scheme was carried out through the members of five union boards and other residents specially selected by them and approved by the chairman of the respective district board. A register was maintained by each individual distributor in which were recorded the whereabouts of the patients and the number of quinine pills given to each. The number of patients treated under this scheme was 14,048, 28,835, 11,934, 10,439 and 7,962 in 1934-35, respectively, in the thanas of Arambagh, Burdwan, Chakdah, Paba and Rajbari. The average amount of quinine consumed per head of population was 8 grains in 1934-35 against 15.4 grains in 1933-34. There was no reduction in the number of deaths from malaria in the scheme areas, but one or two years' work is not sufficient to produce appreciable effect on vital occurrences.

TRIENNIAL REPORT ON THE CIVIL HOSPITALS AND DISPENSARIES IN THE CENTRAL PROVINCES AND BERAR FOR THE PERIOD ENDING 31ST DECEMBER, 1934. BY COLONEL N. M. WILSON, O.B.E., I.M.S., INSPECTOR-GENERAL.

The triennium ending December 1934 unfortunately synchronized with an unprecedented financial stringency which crippled the activities of the medical department seriously. All new schemes of expansion of medical facilities had practically to be kept in abeyance. The number of dispensaries stood at 336 [337]*. Twenty-one new dispensaries of a permanent nature were, however, established, while the 22 dispensaries that were closed were of a temporary nature, being mostly attached to missions and mines. Six cheap-plan dispensaries were established in rural areas with government grants. Accommodation in the existing hospitals continued to be limited, and the number of beds could be increased by only 90 to 2,188. The scheme of subsidizing qualified medical practitioners to settle in villages was finally abandoned during the triennium owing to its failure except in one village in Berar where it was retained as a special case. Experience thus seems to point to cheap-plan dispensaries and travelling dispensaries as the more effective agencies for bringing medical relief to the villagers; and Government considers that extension of rural medical relief should in future be in that direction.

Statistics of attendance and work done in the medical institutions gave further indication of the growing appreciation by the public of their activities. The number of outpatients was 8,770,842 [8,205,858], while indoor patients increased from 33,281 in 1931 to 36,031 in 1934, and the number of operations increased by 18,553 to 306,689. A most encouraging feature was a further increase in the number of women patients. Of the total number treated in 1934, 21.78 [20.52] per cent were treated in the Dufferin Hospitals and 20.40 [18.08] in general hospitals.

Although post-graduate training of the assistant medical officers and assistant surgeons had to be kept in abeyance as a measure of economy, there was no set-back to general medical education, and 127 [106] assistant medical officers passed out of the Robertson Medical School during the triennium. The principle of associating selected independent medical practitioners with the staff of government hospitals in professional and educational work was further extended with great advantage to the public. The Central Provinces Medical Examination Board also instituted the practice of appointing examiners from the staff of colleges outside the province.

The triennium recorded a further advance in the training of nurses, and training classes were sanctioned for the provincialized hospitals at Amraoti and Raipur. Forty-two [27] nurses were under training. The Central Provinces Medical Examination Board held six examinations in medical and surgical nursing for candidates trained for three years, and 30 probationers passed their final examination. A system of training midwives for two years in women's hospitals and their examination by the board in elementary nursing and midwifery was initiated during the period. The board held six examinations for such midwives and 60 of them passed the test. The scheme of appointing staff nurses for main hospitals remained in force; but only two hospitals had such nurses while the others could not retain them for lack of funds. The nursing staff in all the hospitals in the province is, however, yet far short of the requirements of modern treatment; but owing to financial stringency Government has been unable to take any effective steps for strengthening this essential branch in the organization for medical relief. Since the close of the triennium the whole question has, however, been thoroughly re-examined by

* [The figures in brackets refer to the triennium 1929-1931.]

Six hundred and thirty-nine deaths were reported from towns, of which 210 occurred in Calcutta and 14,124 in the rural areas. Compared with 1933, the death rate in all Bengal towns decreased by 10 per cent and in Calcutta by 10.5 per cent. In rural areas, the number of deaths increased by 1,366 with a corresponding increase of death rate by 11.1 per cent. Forty-six towns returned death rates above the provincial urban average (0.18 per mille), the highest mortality from kala-azar (1.7 per mille) having been registered in Jessore. As in the previous year, 45 towns recorded no death from kala-azar. Kala-azar was responsible, in 1934, for 1.9 per cent of fever deaths and 1.2 per cent of the total provincial mortality, against 1.6 and 1.1 per cent, respectively, in 1933.

Enteric fever.—Compared with the previous year, the death rate from enteric fever, in 1934, showed a decrease of 13.7 per cent in the whole province. The rate decreased by 15 per cent in the rural areas but increased by 2 per cent in the urban areas. The Calcutta rate remained the same as in the last year, viz, 0.80 per mille.

Measles.—The provincial death rate from measles, in 1934, was 0.08 per mille, against 0.09 in 1933, showing a decrease of 11.1 per cent. Compared with 1933, it decreased by 38.5 per cent in the urban and 11.1 per cent in the rural areas and 36.9 per cent in Calcutta. Eight towns returned rates above the provincial urban average (0.08 per mille), while no death from measles was reported from 75 towns. Measles accounted for, in 1934, 0.5 per cent of the provincial fever deaths and 0.3 per cent of the total provincial mortality, against 0.5 and 0.4 per cent, respectively, in 1933.

Dysentery and diarrhoea.—Dysentery and diarrhoea accounted for a total of 53,947 deaths in 1934, with a death rate of 1.1 per mille, against 46,697 deaths with a death rate of 0.9 per mille in 1933. The death rate thus increased by 22.2 per cent, against the previous year rate, and 37.5 per cent against the last quinquennial average (0.8). Twenty-eight thousand, four hundred and eight males and 25,539 females died from these causes. Taken separately, dysentery accounted for 29,674 and diarrhoea 24,273 deaths in 1934, against 25,980 and 20,717 deaths, respectively, in 1933, the corresponding death rates being 0.6 and 0.5 per mille, against 0.5 and 0.4, respectively, in 1933. Dysentery and diarrhoea accounted for 4.6 per cent of the total provincial mortality against 3.9 per cent in 1933.

Respiratory diseases.—Respiratory diseases were responsible for 85,113 deaths in 1934, with a death rate of 1.7 per mille, against 82,173 deaths with a death rate of 1.6 per mille in 1933, showing an increase of 2,940 deaths or 6.3 per cent. The death rate was higher by 30.7 per cent than the provincial quinquennial average. The death rate from pneumonia rose from 45.43 per cent to 48.18 per cent of the total provincial mortality from respiratory diseases, whereas there was a reduction from 6.36 per cent to 4.85 per cent in influenza mortality. As regards phthisis and other respiratory diseases, the mortality ratio was the same as in the previous year. 7.2 per cent of the total provincial mortality was due to respiratory diseases in 1934 against 6.9 per cent in 1933.

Influenza.—In 1934, there was a reduction of 1,099 deaths from influenza against those in the previous year. This reduction was shared both by the urban and the rural areas as well as Calcutta.

Pneumonia.—Deaths from pneumonia rose in 1934 to 41,006 against 37,337 in 1933. This rise was shared both by the rural and the urban areas as well as Calcutta. From 1923, pneumonia has been on the increase in Bengal. Although this is not large, its steady progress is noticeable and should give cause for anxiety. The provincial mortality from this cause, in 1934, was 0.82 per mille against 0.75, showing an increase of 9.3 per cent over 1933.

Phthisis.—Phthisis was responsible for 14,845 deaths in the province in 1934 against 14,802 in the previous year. The number of deaths decreased in the rural

areas by 202 but increased in the urban areas by 245. The provincial death rate from phthisis was the same as in the previous year, viz, 0.30.

Malaria.—Both the survey and control work was continued throughout 1934 by Government in co-operation with the Calcutta Corporation on lines similar to those in the previous year. During the months of January and February, four new villages on the eastern border of the Salt Lake were found to be infested. Breeding places in the Bagmari area within the Calcutta Corporation were also detected. On the northern border of the Salt Lake, *A. ludlowii* was collected from Kalipur. *A. ludlowii* was found breeding in the new cut canal near Narkeldanga Main Road, Goalbari, and in the Beliaghata canal opposite Tollygunj outpost. From March to June, no new breeding place of any importance was detected. In July, a few cases of malaria occurred in the Nebugola areas but there was no outbreak of malaria in an epidemic form during this year. Both in the Nebugola and the Chingrihata areas, malaria showed a decrease, the spleen rate in the former having been 4.0 against 20.0 in 1933, and in the latter 5.0 against 6.0 in 1933. From September to October, a breeding place near the Bagmari burial ground and several others were first detected in the area lying between the new cut canal and the Ultadanga railway station. From November to December, no new breeding place was found. No outbreak of malaria in an epidemic form along the fringe area of Calcutta was reported during the year, the zone of breeding having been limited and checked within half a mile by the joint control work of the Public Health Department and the mosquito controlling brigade of the Calcutta Corporation.

Along the banks of the river Hooghly, most of the previously incriminated areas were still infested with *A. ludlowii*, besides the newly infected areas such as Godakhali along the Kalighat-Falta Railway and Uttarpara along the East Indian Railway. Adults were caught periodically at the railway stations of Majherhat, Howrah, Shamnagar and Shivanipur as well as from the villages Berashi, Baikunthapur, Fuleswar, Seijbaria, Bansbaria and Belur. In the mill areas of Budge-Budge and Chengail efficient control measures were adopted in co-operation with the mill authorities.

In the Canning and the Ichamati areas, an epidemic of malaria occurred in the month of April in a few villages, which on investigation was found to be due to *A. ludlowii*. Consequently, an investigation was undertaken in the neighbouring villages and *A. ludlowii* was found in a number of villages along the Kuri-bhanga river. This river forms the main navigation channel for boats coming from Canning towards Kult lock. Country boats were found to be the carriers of *A. ludlowii* along the Bhangar kata khal from Kult lock down to Kristopur. As the canal passes by the side of Salt Lake, the adults from boats find a favourable breeding place in the highly saline water of the Salt Lake area. Breeding places were also detected in Hasnabad, Haroah, Basirhat, Garia, and Canning, but due to efficient control measures, no epidemic developed in any of the localities. *A. ludlowii* having been found at Belur, the East Indian Railway authorities, on the advice of their Chief Medical Officer, adopted anti-malaria measures in Lillooah for the protection of the railway colony. *A. ludlowii* could no longer be found there. Similarly the Bengal Nagpur Railway authorities took anti-mosquito measures between Fuleswar and Uluberia. Trains stand overnight at those railway stations and adult *A. ludlowii* were found being transported to Howrah by them. Control measures at the source are required, otherwise Santragachi which is a large railway colony where trains stand and are washed would be exposed to infection. The Bhatpara Municipality also undertook anti-malaria measures within the municipal area. Similarly, other municipalities took immediate preventive measures under the existing law.

Saili Malaria Laboratory.—The Malaria Research Laboratory, maintained at Saili Tea Estate in the

Jalpaiguri Duars to find out the vector of malaria in the locality and the seasonal infectivity rate, continued its work during the year under review. Two thousand, five hundred and seventy-four mosquitoes of 18 different species from nine different tea estates were caught. Of these a total number of 1,740 mosquitoes of 12 different species could be dissected. Only *A. philippinensis* and *A. minimus* were incriminated as carriers in the area during 1934. The former species was found infected during the month of October only, and the infectivity rate was found to be 14.28 per cent. The latter species (*A. minimus*) was found infected throughout the year with an infectivity rate varying from the lowest in January (1.09 per cent) to the first peak in June (14.05 per cent), then to the maximum in October (15.10 per cent).

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The results of this experiment as far as it has gone may be summarized as follows:—

(i) In the experimental area there was no rise in the fever incidence in October over that of August but, in the outside area, it showed the usual rise in October.

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The triennium ending December 1934 unfortunately synchronized with an unprecedented financial stringency which crippled the activities of the medical department seriously. All new schemes of expansion of medical facilities had practically to be kept in abeyance. The number of dispensaries stood at 336 [337]*. Twenty-one new dispensaries of a permanent nature were, however, established, while the 22 dispensaries that were closed were of a temporary nature, being mostly attached to missions and mines. Six cheap-plan dispensaries were established in rural areas with government grants. Accommodation in the existing hospitals continued to be limited, and the number of beds could be increased by only 90 to 2,188. The scheme of subsidizing qualified medical practitioners to settle in villages was finally abandoned during the triennium owing to its failure except in one village in Berar where it was retained as a special case. Experience thus seems to point to cheap-plan dispensaries and travelling dispensaries as the more effective agencies for bringing medical relief to the villagers; and Government considers that extension of rural medical relief should in future be in that direction.

Statistics of attendance and work done in the medical institutions gave further indication of the growing appreciation by the public of their activities. The number of outpatients was 8,770,842 [8,205,858], while indoor patients increased from 33,281 in 1931 to 36,031 in 1934, and the number of operations increased by 18,553 to 306,689. A most encouraging feature was a further increase in the number of women patients. Of the total number treated in 1934, 21.78 [20.52] per cent were treated in the Dufferin Hospitals and 20.40 [18.08] in general hospitals.

Although post-graduate training of the assistant medical officers and assistant surgeons had to be kept in abeyance as a measure of economy, there was no set-back to general medical education, and 127 [106] assistant medical officers passed out of the Robertson Medical School during the triennium. The principle of associating selected independent medical practitioners with the staff of government hospitals in professional and educational work was further extended with great advantage to the public. The Central Provinces Medical Examination Board also instituted the practice of appointing examiners from the staff of colleges outside the province.

The triennium recorded a further advance in the training of nurses, and training classes were sanctioned for the provincialized hospitals at Amraoti and Raipur. Forty-two [27] nurses were under training. The Central Provinces Medical Examination Board held six examinations in medical and surgical nursing for candidates trained for three years, and 30 probationers passed their final examination. A system of training midwives for two years in women's hospitals and their examination by the board in elementary nursing and midwifery was initiated during the period. The board held six examinations for such midwives and 60 of them passed the test. The scheme of appointing staff nurses for main hospitals remained in force; but only two hospitals had such nurses while the others could not retain them for lack of funds. The nursing staff in all the hospitals in the province is, however, yet far short of the requirements of modern treatment; but owing to financial stringency Government has been unable to take any effective steps for strengthening this essential branch in the organization for medical relief. Since the close of the triennium the whole question has, however, been thoroughly re-examined by

* [The figures in brackets refer to the triennium 1929-1931.]

Government and a scheme drawn up for the proper re-organization of the nursing staff.

The most crying need of the department is more funds. The demand for new hospitals and dispensaries and for the extension of facilities in existing ones is increasing steadily while there has been a progressive reduction in State grants, local bodies' contributions and private subscriptions. Government agrees with the Inspector-General that efforts must be made to tackle this cause of stagnation in medical relief. The solution of the problem is by no means easy. Provincial revenues have become inelastic; but Government feels that medical relief should receive much greater precedence in the budgets of local bodies even with their reduced resources. It is, therefore, disappointing to note that these bodies have persisted in cutting down their contributions towards medical institutions. Government would also like to reiterate that only the poor and the needy can claim free medical relief from the State and local bodies. There must be a greater readiness to pay for such relief on the part of those who are in a position to pay. The improvements effected in the Victoria Hospital, Jubbulpore, during the period are some evidence that the sources of private generosity has not dried up completely and Government hopes that civil surgeons and dispensary committees will leave no stone unturned to tap them.

ANNUAL REPORT ON THE WORKING OF THE CIVIL HOSPITALS AND DISPENSARIES IN THE PROVINCE OF ASSAM FOR THE YEAR 1935. WITH BRIEF EXPLANATORY NOTES. BY COLONEL C. E. PALMER, I.M.S., INSPECTOR-GENERAL OF CIVIL HOSPITALS

THE total number of beds available was 1,667 (1,266 for males and 401 for females) against 1,646 in 1934. The increase is due to the addition of eight beds in the maternity ward at Imphal, ten emergency beds in the Mission hospital at Jowai and the inclusion of three emergency beds in two outlying dispensaries.

Altogether 2,517,879 patients were treated in all classes of hospitals and dispensaries, against 2,341,044 in 1934. Males increased by 21,549 and females by 155,286.

The increase in female attendance is a pleasing factor. With the spread of health welfare work it is hoped attendance will further increase.

Cholera.—Two thousand three hundred and eighty-five patients were treated in 1935, against five hundred and eighty-eight in the previous year. Of these Sylhet furnished 916, Manipur 598, Kamrup 525 and Darrang 145.

Malaria.—In all 766,896 cases were treated with 116 deaths, against 617,763 and 79, respectively, in the previous year.

The disease was more prevalent than usual throughout the province but the chief increases occurred in the districts of Sylhet (47,643), Goalpara (41,860), Nowgong (21,974) and Kamrup (19,481).

Kala-azar.—There were 5,476 cases and 52 deaths in 1935, against 5,558 cases and 59 deaths in 1934.

The following figures for the last eight years show the numbers treated in hospitals and dispensaries other than those directly under the Public Health Department:—

1928	..	..	..	..	6,574
1929	..	..	..	..	6,166
1930	..	..	..	..	4,308
1931	..	..	..	..	3,755
1932	..	..	..	..	3,696
1933	..	..	..	..	4,443
1934	..	..	..	..	5,558
1935	..	..	..	..	5,476

Although there was a slight decrease in the figure for 1935 when compared with that for 1934, the warning against the increase in the number of kala-azar cases in the province as given in the report for 1933 still holds good and the campaign against kala-azar should not be relaxed in any way.

Tuberculosis of lungs.—There were 1,641 cases with 104 deaths, against 1,573 cases with 100 deaths in the previous year. This disease is very prevalent throughout the province.

Other forms of tuberculosis.—Three hundred and thirty-seven patients were treated in 1935, against 230 in 1934.

Smallpox.—The figures rose from 10 with no death to 40 with one death in 1935.

Influenza.—The figures fell from 34,760 with three deaths in 1934 to 34,365 with equal number of deaths in 1935.

Tumours, malignant.—There were 307 cases with 23 deaths, against 227 cases with four deaths in 1934.

Cases of beri-beri* increased from 88 in 1934 to 139 in 1935. The highest incidence (100) occurred in the district of Sylhet, against 58 in the previous year.

There was a slight increase under pneumonia, and no plague was reported during the year. The figures under enteric fever, syphilis and gonococcal infections are 881, 2,172 and 4,333, against 516, 2,141 and 4,476, respectively in 1934.

Leprosy.—Treatment is available in outpatient clinics at Sadr and Subdivisional headquarters hospitals and at many of the more important outlying dispensaries. The number of such clinics rose from 126 in 1934 to 148 in 1935, while 52 outdoor clinics remained open in dispensaries under the Public Health Department, and nine more clinics were newly opened during the year. Altogether 4,926 against 5,027 cases of lepers in 1934 came under treatment in the leper asylums and other clinical centres in the province including 2,305 cases reported by the leper clinics under the Public Health Department. The leprosy treatment sheds erected in connection with certain local fund dispensaries are appreciated and proving useful. Nine medical officers of the Public Health Department were trained locally during the year under report in the technique of leprosy treatment. Government have made substantial grants towards the improvement of the leper asylum at Gauhati and leper colony at Jorhat. Establishment of leper homes and colonies in or near all municipal towns is under the consideration of Government.

Yaws.—The campaign against yaws was continued during the year. One thousand seven hundred and thirty-eight cases were treated in civil hospitals and dispensaries against 277 in 1934, while 2,625 cases against 1,215 in 1934 were treated by the public health staff in charge of dispensaries under that department. The increase is due to the intensive campaign against yaws which resulted in the detection of more cases.

The Assam Medical Research Society.—Government continued to give a grant of Rs. 25,000 to the Assam Medical Research Society. The activities of the society were chiefly confined to malaria, cholera and dysentery.

The staff during the year numbered 42 of which nine were sub-assistant surgeons of the Public Health Department deputed for a year's training in malariology. One member of the staff completed the course in malariology at Karnal.

Malaria surveys continued to be carried out during the year in order to confirm findings previously recorded. Three new surveys in a hyperendemic area were undertaken to complete data necessary for the investigations in hand.

The treatment centre at Doom Dooma for the evaluation of the use of plasmoquine in the field was continued.

As in the previous years bacteriophage has been extensively used for the control of cholera in this province.

Nowgong and Habiganj continued to be kept as experimental areas where bacteriophage was the sole

*[These may have been cases of beri-beri, but it is not a disease commonly prevalent in Assam. On the other hand, we have first-hand information of an outbreak of epidemic dropsy in Sylhet during 1935, and it seems probable that the report refers to these.—*Editor, I. M. G.J*]

anti-cholera measure employed. In all other areas it was extensively used in the presence of actual cholera epidemics. Nowgong has for the sixth year remained free from epidemic cholera, there having been only nine attacks and seven deaths this year. Habiganj, on the other hand, has been subjected to epidemic cholera, there having been to date 809 cases with 344 deaths, i.e., mortality rate of 42.5 per cent. In the adjoining subdivisions of Sunamganj, South Sylhet, North Sylhet and Karimganj there were 409, 527, 542 and 203 cases with 53.5, 43.4, 45.4 and 47.3 per cent deaths, respectively.

Lieutenant-Colonel L. A. P. Anderson, I.M.S., Director of the Pasteur Institute, Shillong, in his note for the period 1st April, 1935, to 31st December, 1935, when referring to the May 1935 Manipur epidemic remarks as under—

'This epidemic appears to demonstrate a fact which past experience has inclined one to suspect, namely, that when bacteriophage is used for the treatment of the disease in an area where it has not been used before its success is marked, whereas it tends to become less effective, both in prevention and treatment, after prolonged and extensive use in the same district. Whether this is really the case or there are other unknown factors at work is not at present certain but the history of Habiganj in the last two years and the bacteriological findings in the few cases we have been able to investigate from that district, suggest the possibility that the prolonged use of bacteriophage throughout the population may result in the evolution of a type of cholera vibrio which, whilst still capable of producing the disease, has become insusceptible to the action of bacteriophage. Investigations are now in progress which it is hoped will throw some light on this problem.'

REPORT OF THE EUROPEAN MENTAL HOSPITAL AT RANCHI FOR THE TRIENNium 1933 TO 1935. BY MAJOR MOORE TAYLOR, M.D., D.P.H., I.M.S., MEDICAL SUPERINTENDENT

Accommodation.—At present accommodation is available for 296 patients. During 1935 a re-arrangement in the stores and dispensary made available an extra single bedroom in both Tuke and Maudsley wards. The band equipment, which was formerly stored in two single bedrooms in Juan ward, has now been moved elsewhere, and it has also been found possible to convert two large rooms in King Edward and Queen Alexandra wards, formerly used as duty rooms, but not now required, into single bed wards. The single ward accommodation in the hospital has thus been increased by six beds. The large operation theatre in the South section, which was considered superfluous, is at present being converted into a suitable ward for three beds and, in view of the excellent bath rooms attached and its close proximity to the nursing sisters' duty room, it will probably be utilized as the female admission ward.

Most mental hospitals are overcrowded, but in this hospital it is possible to classify patients. Recently attacked and the mild and curable cases are kept separate from chronic and hopeless cases. In overcrowded hospitals the dismay and even terror shown by newly admitted patients being placed in wards which are occupied by more chronic patients displaying insane habits and mannerisms is only too frequent.

Comfortable sitting rooms have recently been provided in Tuke and Maudsley wards where relatives may visit patients and by partitioning the large dining rooms in King Edward and Queen Alexandra wards, provision has been made for sitting rooms in these wards also. These are greatly appreciated both by the patients and their relatives.

The number of patients discharged as 'improved' has diminished as compared with former years. This must not be taken to indicate that the mental state and general health of patients have not improved during residence in the hospital for this period. Improvement has, in fact, occurred in the majority of patients, but in the past the re-admission rate to this

hospital was extremely high, and as pointed out in the annual report for last year, too early discharge frequently means that the patient labour and care of months may perhaps be thrown away in one afternoon.

Health of patients.—No epidemic or infectious disease has affected the hospital during the period under review, and comparatively few patients have been confined to bed for physical reasons other than the feebleness of old age. The dietary scale is maintained at a satisfactory level and all patients are weighed at monthly intervals. The medical and nursing care of the patients was all that could be desired. All the wards in the hospital are under nursing sisters. This adds greatly to the comfort and happiness of the patients. Maniacal, restless, or resistive male patients are undoubtedly more tractable to feminine persuasion than to masculine dictation, and violence is often quelled or averted by the mere presence of female nurses, while the almost complete absence of artificial feeding in this hospital must also be attributed to feminine influence.

Absconding.—Few attempts have been made to abscond, and none have been successful. Every endeavour is made to make the patients feel that their liberty is not being unduly interfered with. Nearly two maunds of brass locks and bolts were removed from the doors of the wards during 1935, and full parole, which adds to the contentment of the patients, and is also a method of treatment, is almost universal. Parole is rarely abused, but in granting it mistakes are bound to occur. To the chronic patients it affords a very pleasant break from hospital life, and tends to make them more contented, while in the case of the recoverable patients it is a valuable means of preparing them for return to their ordinary life at home. The principle adopted in this hospital is to consider it better to err on the side of giving too much freedom than too little. It is not considered that 'safety first' is the best motto for a mental hospital.

Treatment.—An endeavour has been made to keep in touch with and practise all modern methods of treatment. Those which have proved beneficial in the past, e.g., occupational therapy including physical drill, diversion therapy, in the form of various entertainments, hydrotherapy, pyrexial and malarial therapy and prolonged narcosis are continued. The recovery rate, however, is the question that is of most interest to the Governments concerned, and details regarding treatment will not be entered into.

It was indicated in the annual report of this hospital for last year that psychiatrists should be more conservative in the use of the word 'recovery', and although the recovery rate for 1935 in this hospital is the highest for the triennium under review, no claim is put forward that miracles of readjustment or resocialization have been performed. The term 'recovered', as used for the year 1935, in this report is intended to indicate that the individuals discharged as recovered were, in the opinion of the committee of visitors, capable of returning to their proper sphere adequately equipped to carry out their own particular tasks. Some of them no doubt live under the shadow of recurrence, and others may have recovered in spite of, rather than because of, the treatment, for it has to be admitted, and the vast majority of those dealing with mental patients will agree, that the whole question as regards psychological medicine to-day can be summed up in two facts, namely, that adequate understanding of mental disorders and adequate therapy are both wanting.

In our present state of knowledge the advocacy of sterilization as a panacea against mental disorders is futile. It will not even touch the fringe of the problem. Both the nature of the individual's genes and the nature of the environment under which he or she has developed must be considered. A diversity of environment may make all the difference between a normal and an abnormal individual. No one can contradict that individuals having certain combinations of genes are more liable to tuberculosis or to diabetes than those bearing other combinations, but the conditions under which the individual lives are the decisive factors

in determining whether he shall fall a victim to tuberculosis or diabetes. Experience shows that some types of mental disorder do have a higher incidence in certain families, and this would indicate that defectiveness of genes plays a rôle in their production, but the environmental factors in many cases are probably the occasion for the onset of a mental disorder, although certain gene combinations succumb more readily than others. There is certainly no reason for assuming for any type of mental disorder that the cause must be sought exclusively in gene defects, and it will indeed be disastrous if recognition that genetic factors play a rôle in mental disorders should lead to neglect of environmental factors. The propaganda for sterilization of the mentally disordered has now reached the lay press, but the complexities in the rules of inheritance are entirely ignored.

Many cases resulting from a seriously defective genetic constitution are encountered where there is little or no chance for aid through the environment, and it cannot be denied that the cutting off of the propagation of such individuals is the only measure of control, but sterilization as a general preventive measure is not of simple application. Many defective genes are recessive, and many normal individuals carry them and transmit them to descendants where they may manifest themselves in mental disturbance. The investigations of reliable geneticists indicate that normal carriers of defective genes are much more numerous than the actually defective individuals, so that the difficulty presented is colossal.

No unbiased observer can doubt that psycho-analysis has thrown great light on normal, and abnormal, behaviour, and that it has been an important contribution to psychiatry, but its metaphysical or metapsychological postulates stand in urgent need of scientific testing. It is at the same time evident that the psycho-analytic approach to the therapeutics of the psychoses has failed. Psycho-analysis is pre-eminently an individual psychology, and statistical methods must be applied to a large series of cases, lest conclusions from insufficient data be accepted as valid and universally applicable. Psycho-analysis as it stands to-day is open to very grave abuse. Perfectly honest and well-meaning men, themselves seriously neurotic, and who have been drawn into the field because of their own inner difficulties, have made serious blunders in practice because of their neurotic inclinations and inadequate training. In other cases actual dishonesty with exploitation of the name of psycho-analysis is possible, and, as is usual in medical things, the public have no way of discriminating between the honest, well-balanced, well-trained analyst on the one hand, and the neurotic, dishonest, or inadequately trained man on the other.

To have changed the 'madman' and the 'possessed' into sick persons in need of human consideration has been a great accomplishment, but basic investigations into the nature of mental disorders can hardly be said to have commenced. The literature has been choked by a mass of material which is utterly confusing, and a newer and more truly scientific estimation of the whole subject is an urgent need. The stultifying distinction between 'functional' and 'organic', between 'mental' and 'physical' must disappear before an approach to psychiatry can be made in an unbiased way.

In this vast country enquiry has revealed that not a single rupee is expended on research work in the realm of mental disorders. It must be realized that few, if any, medical superintendents of mental hospitals have the technique for research work, and circumstances prevent most of them from pursuing scientific studies. The greater part of a superintendent's time has to be devoted to the perhaps less fascinating, but no less arduous, duties of administrative work, and he must also act as the chief medical adviser in a medical staff barely sufficient for the medical needs of the hospitals, not to speak of the intensive psychotherapeutic work which patients in mental hospitals require.

Mental hygiene, as a public health measure, needs no justification to-day, and its place in the broad field

of public health and social welfare must be firmly entrenched and permanently assured. It is surely just as important to study the causes of mental disease and the methods of controlling it, as it is to compile the statistics of cholera, smallpox and typhoid fever.

The education of the public and legislators cannot begin too soon with the acceptance of the fact that a certain share of public funds must be spent for research, and any curtailment of investigative work must not, in the future, be looked upon as brilliant economy. Large resources are required and a comprehensive survey will involve many means and instrumentalities, and will consume time. It is not feasible to expect any one province to carry on the heavy financial responsibilities involved in research, the burden is one which must be shouldered by the Central Government.

Investigators without a solid background in clinical psychiatry will not be able to benefit psychiatry. Conditions should be such that the best of our young graduates will be prepared to devote themselves to this work. They should be given a sound preliminary training in a modern mental hospital, and there they will find that the medical staff will be only too ready to indicate to research workers how far in the psychiatric field there are indications along their special lines. They should then be sent to a Research Centre in Europe or America, where they can assimilate some of the general principles and methods involved in research and necessary medico-biological techniques. It is a crying need to encourage any one, be he chemist, cytologist, pathologist, comparative neurologist or psychologist, who is on the track of fundamental knowledge. The problem will also include a search for untoward conditions, social and economic, which breed and multiply disorders. Governments and the public must be brought to realize that much has yet to be learnt about the early stages of mental disease, and most of all in its prevention, and that they utterly fail in their duty when they merely provide mental hospitals for the custodial care for people, mentally ill, whose illness has been allowed to progress so far that they require supervision to prevent them from doing harm to themselves or others. Wider knowledge will diminish mental disorder, and it is folly not to use every available means to bring this about.

Occupational therapy.—A special note regarding the occupational therapy department of this hospital is warranted, although it is not possible to include in full the report of the occupational therapists. The value, both psychological and physical, of the occupational treatment of patients whose infirmities either necessitate a prolonged or short sojourn in the hospital is becoming more apparent to all those concerned in their care and restoration to normal health. The provision of adequate suitable occupation for chronic deteriorated patients between the ages of 35 and 65 is one of our problems. To be therapeutic, an occupation must be purposeful. It does not necessarily mean 'fancy work'. Simple work such as mending clothes offers much scope for initiative, and the atmosphere of an occupational centre is produced. The regularity and responsibility entailed have a valuable effect on the patient. On the female side the crafts taught include tapestry, leather work, embroidery, plain sewing and mending, dress-making, weaving, stocking-making by machine, basket-work, raffia-work, knitting of all types, bead-work and cookery; and on the male side, carpentry, durri- and rug-making, book-binding, upholstering, brass and blacksmith work, carving and cabinet-making. The sale of manufactured articles has been less than in former years, but this is due to the fact that the department now concentrates more on supplying the needs of the hospital. In 1935 this department, besides carrying out all the repairing and renovating work to all clothing and furniture, etc., was responsible for the manufacture of all the uniforms of the ward-boys, ayahs and menial staff, and also a large quantity of new furniture and other hospital requirements, such as chairs, dressing-tables, cabinets, hydrotherapy tubs, jharans, door-mats, carpets, towels, chicks, carpets, bedside-durries, uniform cloth, dresses,

underclothing, tray-cloths, purdahs, etc. The occupational therapists in their report state that the therapeutic effect and self-esteem of the patients who took to constructive work has been roused equally successfully as when they used to occupy themselves with fancy work, for which there was no demand. Many patients apparently find it hard to think of work apart from pay and the Board of Trustees makes an allowance for small remunerations to be paid to deserving workers.

It would not be fair either to the patients or to the occupational department to state that all the efforts incorporated in occupational therapy have been crowned with success. There have been a few miserable failures, but it is certain that a very large number of patients are now strengthened by the thought that they are helping the institution to which they belong—and particularly those who were formerly known as troublesome.

It may be added that the total value of goods turned out from this department during 1935 was Rs. 3,202-6-0, and to Mr. A. K. Mukerji, M.A., the male occupational therapist, must be given most of the credit for this achievement. He took entire charge of the department for four months during the absence of the female occupational therapist on sick leave and he is one of the most valuable members of the staff.

Physical culture.—Classes in physical culture, under a qualified instructor, are organized daily. The patients become genuinely interested, and while improvement is obtained in the poorer type of patient, the best results are obtained in the more advanced classes. It is a very useful auxiliary form of treatment.

Entertainment.—The music and dancing classes continue, and during the year six very successful variety concerts were staged by the patients. Besides the weekly dances and band concerts, the patients held two fancy dress dances, and at both over fifty couples appeared in excellent costumes, many of which were original and were made by the patients themselves.

The hospital possesses a 'silent' cinema, but it has become extremely difficult to procure suitable films, and patients are now sent in batches of twenty to the cinema in Ranchi, when suitable films are being screened. During last year 1,116 tickets for the cinema were purchased for patients. This form of entertainment is greatly appreciated.

The new 24-seater bus has been a great boon, and many drives and picnics have been enjoyed by the patients.

The band continues to function under the leadership of Captain Mayes. It is entirely maintained by voluntary subscription, and it is largely due to the generosity of the Royal Calcutta Turf Club that it continues to exist.

Ample literature and means of amusement are provided in the library and sitting-rooms, and the magazines and periodicals sent from Government House are eagerly sought after.

Two pianos which were beyond repair have recently been replaced by serviceable ones.

Divine service.—The Roman Catholic and Church of England chaplains conduct services in the respective chapels every Sunday, and they have both been assiduous in attending calls to the sick. They have also by tact and sympathy gained the confidence of many patients, and their work has been of therapeutic as well as spiritual value.

[The abstracts we have given from this report should be sufficient indication of its value, and all persons interested in the subject of mental disease in India should read the original, as in it they will find a great deal of instructive matter as well as food for thought.]

ANNUAL REPORT OF THE HENRY LESTER INSTITUTE OF MEDICAL RESEARCH, SHANGHAI, FOR THE YEAR 1935

Introduction

DURING the year 1935 work of the Institute has continued and I think we may claim that definite progress has been made along all fronts.

The Clinical Division has shown that beri-beri is undoubtedly a disease presenting biochemical changes in the body fluids characteristic of B₁ deficiency, though this does not explain the whole of the clinical picture in different types of the disease.

In the Division of Physiological Sciences the investigation of factory diets, as presented recently in a report of work done in collaboration with the Industrial Section of the Shanghai Municipal Council, and published by the Chinese Medical Association, has led to a good deal of attention from the lay community. It is, however, not the function of a research institute to enter the field of social politics, and it should be understood that this work is only part of a general survey of Chinese diets made in an attempt to unravel the nutritional factor in the development of disease. Dr. Read and his colleagues have also shown through their analyses of the vitamin content of Chinese foods that instinct and custom, when not interfered with by modern civilization, provide an adequate amount of these necessary dietetic principles. Of course common sense should tell us as much since there is no civilization that has shown the persistence of that of China, and this would have been impossible if diets had always been inadequate.

In the Division of Pathological Sciences a definite advance has been made in the analysis of the antigenic structure of the typhoid bacillus and in the preparation of a serum which is already proving its value in the treatment of this all-too-prevalent and debilitating disease. The work of this division involves a good deal of field investigation, especially in connection with entomology and parasitology, so that with a view to giving workers in other countries a better idea of the ecological conditions responsible for the spread of parasitic disease in China, Dr. Robertson has given an account of his experiences in the field.

Field medical research in China.—It is chiefly in connection with research work in parasitology and entomology that field observation has been an essential part of the work of the Institute, while we have limited ourselves to subjects of enquiry, the material for which is readily obtainable in the neighbourhood of Shanghai or where the problem is to be found as a whole in the countryside around.

The fundamental consideration underlying field research in this part of China is the existence of a huge fertile plain composed of rich alluvial soil which has been intensively cultivated by countless generations of perhaps the most highly skilled agriculturists in the world. This plain was formed and is still being formed as the delta system of the Yangtze Kiang, one of the great rivers of the world. The region is intersected by a veritable labyrinth or network of waterways, canals and slowly flowing rivers. There are many large lakes which are shallow. Most of these waterways are navigable for the countless small craft used by the inhabitants for the transportation of their market produce, in fact for almost all the activities associated with transportation and agriculture. A vast population constantly spends its entire existence afloat in the different varieties of sampans, junks, barges and so on used. The waterways abound in fish, crustaceans, molluscs, most of which are used for food. The staple industries are agricultural; rice, cotton and silk being the main activities.

The area is very densely populated and there are a number of important cities such as Soochow and Kashing which form centres for the distribution of the products of the country. The use of modern machinery and a factory system is to be found in Shanghai and Wusih. Such facts govern the type of disease which is to be found affecting the inhabitants. Geographically the situation is favourable for mosquito breeding owing to the swampy nature of the plain and the intensive irrigation system connected with rice cultivation. We therefore have diseases such as malaria and filariasis in which the mosquito plays the rôle of vector.

The research aspect with regard to mosquito breeding can be furthered by studying the breeding insectaries constructed in the natural environment of the mosquito.

Problems connected with the nutrition of a population such as that in Central China provide the chief factors connected with diseases, that is to say nutrition in its broadest sense. A population which ultimately depends on the soil on which it lives for food has to obey the natural law of the conservation of energy by returning to the soil the nitrogenous substances it has withdrawn in crops. Thus we have the practice of intensive fertilization of the soil with human and animal excreta practised through the ages. This is in itself a practice which is the soundest agriculture but unfortunately it keeps up the vicious cycle of many important helminthic diseases. Excellent illustrations of these factors in the natural history of disease can be obtained by a study of the trematodes, but while the life cycle of the chief disease-producing members of this group is fairly well known the actual state of affairs in the country is largely a matter of conjecture. We may have matters of enquiry which only represent one detail of a larger problem and this detail has to be worked out under field conditions. Examples are readily found in such a disease as schistosomiasis japonica, a condition potentially affecting several millions of persons in the delta region of the Yangtze Kiang. Yet the secret of the control of this widespread evil may be found in an intensive field enquiry into the habits of a particularly insignificant mollusc.

It is of considerable interest to note that paragonimiasis is in all probability merely accidental in man whilst it undoubtedly is very prevalent in wild animals particularly leopards and tigers. Almost all of these animals recently shot or captured in the neighbouring provinces of Chekiang and Anhwei have been found to be affected. The fresh water crab *Potamon denticulatus* is found in the fresh running streams of the hill regions on the fringe of the cultivated plains. The culinary habits of the people of one or two limited districts near Shaoshing have caused the disease to occur in man. The methods of preparing food and the local customs are most important in research upon helminthic diseases. One can cite clonorchiasis in this connection as it is only prevalent in communities which have a predilection for uncooked fresh water fish.

In fasciolopsiasis we have a parasite which has a most interesting life cycle. The salient facts have been fairly well established but there are particular features in the larval stages which well illustrate the necessity of fully understanding the life cycle as it exists in natural conditions.

Certain water plants such as the water bamboo, water chestnut and water calthrop or ling act as intermediate hosts in a manner which is more important than mere mechanical transmission since the cercariæ which emerge from the specific mollusc attach themselves as metacercariæ to the skins of the plants. Raw ling is difficult to peel and it is very often first bitten at. The cysts are left on the teeth and later swallowed with food. It is only the red ling found in endemic areas such as Shao-san in Chekiang province that is heavily infected with fasciolopsis cysts. Various other varieties are quite free from infection. A study of this question immediately leads us to note that the botanical literature on such water plants in China is very scanty and imperfect. Further instances of the importance of a knowledge of botanical flora in field work is well brought out in connection with elephantiasis. This condition is common in the Huchow district, many villages having 30 per cent or 40 per cent of the inhabitants affected. The larvæ of the mosquito *Mansoni uniformis*, which probably acts as a vector, attach themselves by a breathing tube to the roots of water plants and thus obtain air from the roots of aquatic plants without coming to the surface. Such field data are essential in the proper interpretation of laboratory findings in many problems of entomology.

Again an insect may be highly susceptible to experimental infection with a disease organism under

laboratory conditions and yet not be a factor in the transmission of the disease under natural conditions in the field because its natural feeding habit may not bring it in contact with man. Both sets of findings have to be correlated in order to assign a species of insect its proper place in the epidemiology of a disease under local conditions.

Different species of mosquitoes show a particular preference as to what type of water they will breed in. We have found the type of field insectary which is in use at our field entomological station at Kaochiao very practical for breeding and studying *Anopheles sinensis* under natural conditions. The construction is a wooden and bamboo framework supporting wire gauze netting. These insectaries enable us to study larval breeding where the customary factors all exist such as aquatic vegetation and the normal temperature and reaction of the water.

In the breeding rooms at the Lester Institute we are able to vary experimentally many of these natural factors, therefore the field insectaries are supplementary to the laboratory breeding rooms and used for different purposes.

It is of interest to note that the Shanghai Waterworks tap-water used in the Institute, which is highly purified and chlorinated, is unsuitable for many biological experiments connected with the artificial cultivation of mosquitoes, molluscs, crustaceans and fish. We have overcome this difficulty by using shallow well water and recently have had such a well constructed in the Institute grounds. At the same time artificial conditions never absolutely simulate the environment which exists in nature.

Water or some factor related to water plays an important rôle in very many of our field problems. We even use water transportation very largely when visiting endemic centres of the various parasitic diseases under investigation.

[The reports of the divisions themselves are full of interest but do not lend themselves to abstraction; they are well worth perusal especially by research workers. Concrete evidence of the activity of this institute is available in an appendix, where 75 papers published by members of the staff during the year are listed.]

Correspondence

DRUG ADDICTION IN INDIA AND ITS TREATMENT

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—As I have had a number of enquiries in connection with the lecithin treatment for opium addiction referred to in your *Gazette* for August 1935, would you kindly insert the following in your journal in order to save correspondence:—

Dr. T. H. Wang, Director, Municipal Health Administration, Nanking, informs me 'Lecithin is obtainable from the Central Field Health Station, Nanking. It is prepared in two forms, the cakes and the jelly. The price in Chinese dollars is \$1.80 per box of 18 cakes and \$3.00 per pound for the jelly. It may be ordered directly from the above station. I do not know whether it is obtainable in India'.

Yours, etc.,

ROBERT E. WRIGHT, C.I.E.,
LIEUTENANT-COLONEL, I.M.S.,
Superintendent.

GOVERNMENT OPHTHALMIC
HOSPITAL, MADRAS,
17th September, 1936.

[Lecithin can now be obtained without difficulty in India.

The preparation used in the School of Tropical Medicine is prepared by Merck.—EDITOR, I. M. G.]

AN UNUSUAL CASE OF SUICIDAL STABBING

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—I read with interest in your issue of August 1936 a case reported under the above heading.

Two years ago when I was working as civil surgeon. Dwarka, near Post Okha, I came across a similar case in which a man—a renowned convict who was released ten years ago from Baroda Central Jail for his good behaviour and who had turned very religious since then—stabbed his abdomen with two similar cuts and the omentum and transverse colon came out. When I went to see the case he was alive and told me in unmistakable terms that he wanted to end his life by dedicating it to the god Shiva as a penance for his past deeds.

I wondered how he could do that, but to my surprise he allowed me to replace the protruding viscera back into his abdomen without chloroform or any other anæsthetic. He lived a day or two more and we got his evidence recorded before the police and a magistrate.

This case proves that a man in intense feeling can do such injuries to himself.

Yours, etc.,

V. M. BHATT, L.M. & S.,
Medical Officer.

VISNAGAR,

24th September, 1936.

LATE REACTIONS AFTER ANTI-CHOLERA INOCULATION

To the Editor, THE INDIAN MEDICAL GAZETTE

SIR,—With reference to your correspondence in April 1936, I would like to inform you that in the last epidemic of cholera in Kashmir Province the total number of anti-cholera inoculations performed under my supervision reached 376,280. We used the vaccine supplied to us by Haffkine and Kasauli Institutes. The total number in which a delayed reaction of this kind occurred was only 0.08 per cent. This came up between the 7th and 8th days. The reaction remained for two to three days. Local as well as general reaction was observed. It had nothing to do with the primary reaction. This was even seen in those persons who did not feel any inconvenience just after the inoculation.

Usually, it was marked in healthy robust persons. There could be no question of asepsis (? sepsis). No abscess has been seen among these.

Yours, etc.,

(Signed)

Epidemic Medical Officer,
Jammu Province.

JAMMU, H. C. D.,

23rd September, 1936.

Service Notes

APPOINTMENTS AND TRANSFERS

COLONEL I. M. MACRAE, C.I.E., O.B.E., K.H.P., Assistant Director, Medical Services, Peshawar District, is appointed to be Officiating Deputy Director, Medical Services, Northern Command, *vice* Major-General A. W. M. Harvey, K.H.S., on combined leave, dated the 9th June, 1936.

Lieutenant-Colonel F. R. Thornton, M.C., on return from leave, is appointed to be Civil Surgeon, Dharwar, and Superintendent, Mental Hospital, Dharwar.

On return from leave, Lieutenant-Colonel S. R. Prall is re-posted as Superintendent, St. George's Hospital, Bombay.

Lieutenant-Colonel A. H. Hurty, on return from leave, is appointed to be Civil Surgeon, Ahmedabad, with attached duties, *vice* Lieutenant-Colonel B. Z. Shah.

Lieutenant-Colonel P. Banerji, Civil Surgeon, Murshidabad, on relief, is appointed to act, until further orders, as Superintendent, Campbell Medical School and Hospital, Calcutta, *vice* Lieutenant-Colonel J. C. De granted leave.

Lieutenant-Colonel N. C. Kapur, on return from leave *ex-India*, is appointed as Civil Surgeon, Murshidabad, *vice* Lieutenant-Colonel P. Banerji transferred.

The services of Major G. S. Gill were placed permanently at the disposal of the Government of Madras, with effect from the 17th April, 1932, for employment in the Madras Jail Department.

Major S. D. S. Greval, Officiating Imperial Serologist, Calcutta, is confirmed in that post, with effect from the 15th April, 1936.

The services of Major W. H. Crichton, Health Officer, Simla, are placed temporarily at the disposal of the Chief Commissioner, Delhi, for appointment as Assistant Director of Public Health, Delhi Province, Health Officer, New Delhi, and Health Officer, Notified Area Committee, Civil Lines, Delhi, on probation for 1 year, with effect from the date he assumes charge.

Major A. D. Loganadan, Officiating Assistant Director of Public Health, Delhi Province, Health Officer, New Delhi, and Health Officer, Notified Area Committee, Civil Lines, Delhi, is appointed Health Officer, Simla, on probation for 1 year, *vice* Major W. H. Crichton transferred to Delhi, with effect from the date he assumes charge of the post.

Major R. C. Wats, Officiating Assistant Director, Haffkine Institute, Bombay, is placed on foreign service under the Indian Research Fund Association, for appointment as Officiating Assistant Director, Malaria Survey of India, Kasauli, with effect from the date on which he assumes charge of his duties.

The services of Major P. V. Karamchandani are placed temporarily at the disposal of the Government of Madras for employment in the Jail Department, with effect from the date on which he assumes charge of his duties.

On reversion from foreign service under the Indian Research Fund Association, the services of Captain J. R. Dogra, an Officer of the Medical Research Department, are placed temporarily at the disposal of the Government of Bombay, for appointment as Officiating Assistant Director, Haffkine Institute, Bombay, with effect from the date on which he assumes charge of his duties, *vice* Major R. C. Wats.

Captain E. H. Lossing, Civil Surgeon, Burdwan, on relief, is placed on general duty at the Medical College Hospitals, Calcutta.

The undermentioned appointments are made:—

To be Lieutenants (on probation)

1st February, 1936

James Munchin Francis Byrnes.

William John Young.

LEAVE

Lieutenant-Colonel S. A. McSwiney, Officiating Professor of Obstetrics, Medical College, Calcutta, is granted combined leave for 2 years, with effect from the 13th October, 1935. The previous notification is hereby cancelled.

Lieutenant-Colonel R. C. Clifford, M.C., Civil Surgeon, Simla West, is granted leave for 4 months, with effect from the 15th October, 1936.

Major T. A. Doran, Officiating Civil Surgeon, Dharwar, and Superintendent, Mental Hospital, Dharwar, is granted leave for 12 months, with effect from the 12th October, 1936, or the subsequent date of availing.

Major J. S. Galvin, Officiating Superintendent, St. George's Hospital, Bombay, is granted leave for 6 months and 15 days, with effect from the 16th October, 1936, or subsequent date of relief.

Major T. H. Thomas, Officiating Surgeon Superintendent, Presidency General Hospital, Calcutta, is granted leave for 4 months and 20 days, *ex-India*, with effect from the 16th November, 1936, or from any subsequent date on which the leave is availed of.

Major S. L. Patney has been granted by the High Commissioner for India a further extension of leave for 42 days.

PROMOTIONS

Majors to be Lieutenant-Colonels

H. M. Salamat-Ullah, M.C. Dated 5th August, 1936.

G. R. Oberai. Dated 19th August, 1936.

J. E. Dhunjibhoy. Dated 20th August, 1936.

J. Chandra. Dated 21st August, 1936.

Captain to be Major

R. A. Haythornwaite. Dated 18th August, 1936.

Lieutenants (on probation) to be Captains (on probation)

T. P. Mulcahy. Dated 12th May, 1936, with seniority from 27th December, 1935.

R. J. Henderson. Dated 24th June, 1936.

The seniority of the undermentioned Lieutenants (on probation) is antedated to the 27th December, 1934:—

P. A. Hubbard.

T. P. Mulcahy.

F. E. McLaughlin.

RETIREMENT

Lieutenant-Colonel H. H. King, C.I.E. Dated 13th August, 1936.

RESIGNATION

Captain B. F. B. Russell. Dated 6th July, 1936.

Notes

'STYPVEN'

RUSSELL VIPER VENOM (NOT FOR INJECTION)

RECENT investigation has shown that even a very dilute solution of Russell viper venom has hæmostatic properties which are of great use clinically.

'Stypven' presents Russell viper venom in the most convenient form. It is issued in rubber-stoppered bottles accompanied by hermetically-sealed ampoules of solvent consisting of sterile distilled water containing 0.5 per cent phenol. A solution of Russell viper venom of the necessary concentration is thus readily prepared by adding the solvent to the 'Stypven' in the rubber-stoppered bottles provided.

The external bleeding which usually occurs in hæmophilics after the extraction of teeth, may now be controlled and the extraction undertaken with reasonable safety. Further, 'Stypven' acts as a hæmostatic in any external wounds suffered by hæmophilics.

It has also been found that, apart from hæmophilics, a considerable number of patients bleed more profusely than usual after the extraction of teeth. With patients of this kind the application of a pledget soaked in 'Stypven' solution, immediately after extraction, leads to rapid cessation of the bleeding, and the patient may shortly afterwards be safely released.

Although the possible uses of this hæmostatic in general surgery have not been fully investigated, it may be that the solution alone or with adrenalin may be of considerable use in nasal-oral operations followed by troublesome bleeding or oozing.

'Stypven' is prepared at the Wellcome Physiological Research Laboratories and supplied in two sizes, 1 c.cm. and 5 c.cm., by Burroughs Wellcome and Co., Snow Hill Buildings, London, E.C.1. and Cook's Buildings, Hornby Road, Bombay.

A CALCIUM AND PHOSPHORUS PREPARATION

RECESAL is a calcined sodium di-hydro-ortho-phosphate prepared by a special process.

The importance of phosphoric acid for the organism is well known. The supply of phosphoric acid and the degree of muscular and nervous capacity of output are directly correlated. Excretion of phosphoric acid in the urine is increased by illness, over-exertion and even ordinary labour. The phosphoric acid shortage thus created is compensated by Recresal, for the phosphoric acid contained in normal food cannot make up the loss. Years of clinical experience have proved that Recresal raises the physical and mental output very considerably and that it helps to shorten the duration of all illnesses.

Recresal is soluble both in the acid gastric juice and in the alkaline intestinal juice and, therefore, rapidly and completely absorbed. It can be taken for years and is quite innocuous (even in high over-dosage), for it has nothing in common with irritant stimulants, such as arsenic, caffeine and strychnine.

One to three tablets, twice daily, 15 minutes after breakfast and after the midday meal, should be ordered. Tablets should be allowed to disintegrate in the mouth, or be broken up and swallowed with a little water.

It is indicated in all infectious diseases, for the restoration of the equilibrium of the system, and for the mobilization and stimulation of the natural forces of defence, especially during convalescence; in constitutional and debilitating diseases; in conditions of physical and nervous exhaustion after excessive strain particularly in school children; and to accelerate the healing of wounds after surgical operation.

It is manufactured in England by Messrs. Coates and Cooper, Limited, 94, Clerkenwell Road, London, E.C.1.

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Communications for the Publishers relating to Subscriptions and Advertisements should be addressed to THE PUBLISHERS, *The Indian Medical Gazette*, P. O. Box No. 54, Calcutta.

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Original Articles

AMOEBIASIS AND APPENDICITIS

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CHRONIC AMOEBIASIS, always a difficult condition to treat, is frequently encountered by medical practitioners in the tropics. According to Knowles *et al.* (1928), chronic intestinal amoebiasis as a cause of sickness and incapacity is of great importance, especially among the European community. The presence of *Entamoeba histolytica* in the system, however scanty in number, devitalizes the patient considerably and renders him susceptible to other infections. It is also responsible for producing a variety of neurasthenia, encountered in tropical climates. Generally, the patient complains of vague abdominal symptoms, but the clinical features may point to the appendix as the seat of mischief.

A routine examination of stools of patients admitted into the Carmichael Hospital for Tropical Diseases showed an incidence of 12 per cent of infection with *E. histolytica* (Chopra, 1936). It is proposed in this paper to investigate the causal relationship of amoebiasis and appendicitis. It may be of interest to note that the appendix is frequently involved in the pathological processes that are met with in acute infective fevers, particularly in children, but that suppurative appendicitis is rare. Mayerhofer (1934) refers to such cases as 'pseudo-appendicitis'. The suitability of the term has been questioned, but the knowledge of the existence of this condition is of some importance. The incidence of acute appendicitis in the Indian child is also worthy of note (Ray, 1935).

I. Amoebic carriers

Clinically, these people harbour the parasite without however suffering from any definite signs and symptoms. It has been shown that *E. histolytica* is not always a tissue parasite; it can occur in the large intestine without tissue penetration. A latent infection does not always mean gross ulceration of the bowel, but an ulcerative process may be established at any time (Chopra, 1936). In others, the symptoms

may be those of 'tropical neurasthenia', viz, irritability of temper, nervousness and vague gastro-intestinal disturbances. If the symptoms are at all definite, these consist of constipation, irregular attacks of diarrhoea, nausea, flatulence and loss of appetite. Of the neuralgic manifestations, frontal headache and lumbago are worthy of mention. Abdominal pain is rare, though discomfort is common, but it is of importance to note that colicky pains in the lower abdomen or the right iliac fossa are occasionally met with. It is consequently somewhat difficult to differentiate the condition clinically from subacute appendicitis.

On examination

Sallowness of complexion, anaemia and loss of weight may be prominent signs. Physical examination may be negative or in some cases tenderness may be elicited over the right iliac fossa.

Pain and tenderness in the right iliac fossa need careful investigation (Craig, 1934).

(1) *Clinical history*.—Unfortunately, a clear history is not often forthcoming. Acidity, epigastric pain, and subcostal discomfort may point to duodenal ulcer or cholecystitis. A positive family history of amoebiasis is worthy of careful attention.

(2) *Examination and culture of faeces*.—The presence of the trophozoite or the cyst of *E. histolytica* is confirmatory evidence, but these are often difficult to find, so a single negative result is of little use in excluding this infection.

(3) *Sigmoidoscopy*.—The lesions of chronic amoebic dysentery are most commonly observed in the rectum and caecum. The former is available for sigmoidoscopic examination, and this is never to be neglected in doubtful cases. The following points should be carefully looked for:—

(i) *Nodules*.—These are rounded elevations, situated over the crest of the plicae transversalis of the rectum and sigmoid. When they are scraped, a viscid gelatinous material escapes, often containing the trophozoite.

(ii) *Ulcers*.—The so-called 'button hole' ulcer is occasionally met with. The edges are usually undermined and shaggy.

(iii) *Sinuses*.—In the majority of the cases investigated, connecting sinuses were traced between the ulcers.

(iv) *Scars*.—The smallest are oval or rounded with pigmentation near the centre. Cicatricial stenosis is not infrequent.

(v) *Scrapings*.—These should always be examined for the parasite. Sigmoidoscopy was carried out in 28 cases. In 11, the examination of the stools for cysts was positive. In 3, parasites were present in the scrapings but were not found in the stools. Of the remaining 14 which were negative, the therapeutic test with emetine was successful only in two.

TABLE I
Sigmoidoscopy (28 cases)

Ulcers	25
Strictures	6
Stools positive for cysts	11
Parasites in scrapings	3
Therapeutic test with emetine	2
Non-specific colitis	12

It is necessary to keep in mind the incidence of non-specific colitis, which is often difficult to differentiate from the very chronic form of colitis of amœbic origin. In the non-specific group, secondary infection may give rise to extensive ulceration, scarring and stenosis.

II. Appendicitis of amœbic origin

Acute inflammation of the appendix of amœbic origin is occasionally seen on the post-mortem table, but amœbic appendicitis is usually chronic or subacute in character, either in a 'carrier' or in a patient who is subject to chronic amœbiasis. Rarely, there may be an acute onset with pyrexia, vomiting and localized pain over the right iliac fossa.

On physical examination

Local tenderness and rigidity may be well marked. But in 43 per cent of these cases, during an acute attack or exacerbation, subcostal pain and palpable enlargement of the liver are present. In 65 per cent, pain over the iliac and sigmoid colon and some thickening are present. In 2 per cent, crepitations were noted anteriorly above the upper margin of the liver.

Clinically, two types of case may be met with, each giving a history of either (a) recurrent attacks of evanescent diarrhoea, or (b) recurrent attacks of constipation. The onset is usually precipitated by the administration of a purgative, e.g., castor oil or Epsom salts, or by an indiscretion of diet.

The following are typical cases :—

Case I.—The patient, aged 35, a medical practitioner, suffered from several attacks of amœbic dysentery since 1929. Each time emetine was administered with success after a positive examination of stools. During September 1933, suffering from troublesome constipation, he took a dose of castor oil. This brought about what was clinically diagnosed as acute appendicitis. The patient was placed under the Ochsner-Sherren method of treatment. Within a few days a lump was formed in the right iliac fossa, accompanied by definite enlargement of the liver, subcostal tenderness and icteric tinge of the conjunctiva. Leucocytosis 18,000. Eosinophiles 5 per cent. Cysts of *E. histolytica* being present in the stools, emetine was injected in the usual way. Both the conditions rapidly cleared up and appendicectomy was performed later. The pathological report showed chronic inflammation of the submucosa with some fibrosis. The patient has remained well since the operation.

Case II.—The patient, aged 29, was subject to recurrent attacks of dysentery for the past four years. The stools were positive for amœbæ on two occasions. During October 1934 the patient was admitted into the hospital with an 'acute abdomen'. On examination, the patient looked very ill and jaundiced. Temperature—103°F. Pulse respiration rate—140/50. The abdomen was distended, rigid and tender, the liver,

particularly the right lobe, was enlarged and crepitations and pleural friction sounds were present over the base of the right lung. Leucocytosis—19,500 per c.mm. Eosinophiles—4 per cent. On rectal examination, a tender lump was found in the right iliac fossa. Amœbic cysts were present in the stools and emetine was administered in the usual way. The convalescence was uneventful. Some thickening, however, of the iliac and sigmoid colon persisted. Appendicectomy was performed.

Progress of these cases.—A careful analysis of this group of cases leads one to advocate the Ochsner-Sherren method of treatment with administration of emetine. There is no doubt that the colonic lesions are readily amenable to this treatment. But the patients are liable to subsequent attacks of appendicitis, either as a result of inflammatory changes in the appendix or the recurrence of amœbic lesions in the appendix. There was an operative mortality of 1 in a series of 400 cases.

It is of interest to note that in about 45 per cent of cases of appendicitis, a positive history of dysentery within a period of 12 months is forthcoming. In these cases amœbic dysentery is about 10 times commoner than bacillary dysentery. Table II is of interest in this connection.

Diet does not appear to have any definite bearing on the incidence of appendicitis, which is fairly evenly distributed among both vegetarian and non-vegetarian classes of patients.

In the column 'appendicitis and amœbiasis', only those cases are included in which the stools or scrapings were positive for the cyst or the trophozoite and responded to an exhibition of emetine. It is worthy of note that, in a series of 475 cases of appendicitis, there was a positive history of dysentery within a period of 12 months in 45 per cent of cases. The incidence of amœbiasis and appendicitis, however, amounts to only 5 per cent. Unfortunately, in 56 per cent of cases a course of emetine treatment was carried out by the medical attendant before the patient was handed over to the surgeon or admitted to a surgical ward. In this type of case, the symptoms are rarely of an urgent nature, so there is nothing to lose and everything to gain by giving a course of emetine injections for a week or so to patients coming from areas where amœbiasis is endemic, before operating for suspected chronic appendicitis (Rogers and Megaw, 1935).

The incidence of appendicitis as a complication in amœbic dysentery is considerable, as reliable data show. Strong (Osler and McCrae, 1926) in his series of 100 fatal cases of amœbic dysentery found that appendicitis occurred as a complication in 7, and that in 1 chronic appendicitis existed in connection with a pericæcal amœbic abscess. Clark (1925) in a series of 186 autopsies upon cases of amœbic dysentery found amœbic ulcerative appendicitis in 76 cases (over 40 per cent), and of these 9.2 per cent had resulted in perforation or abscess formation. He states that 'in about one-half

TABLE II
Incidence of appendicitis and accompanying conditions

Ages			10	20	30	40	50	60	TOTALS
Acute appendicitis ..	Indian	M.	..	1	2	..	..	..	3
		F.	..	..	..	..	..	..	..
		M.	1	..	..	..	..	..	1
		F.	..	..	..	..	..	..	..
	TOTAL		1	1	2	..	..	..	4
Quiescent appendicitis ..	Indian	M.	17	65	81	23	5	..	191
		F.	7	13	13	5	1	..	39
		M.	3	18	13	4	..	..	38
		F.	18	18	11	7	3	1	58
	TOTAL		45	114	118	39	9	1	326
Appendicitis and cholecystitis ..	Indian	M.	..	9	13	3	2	..	27
		F.	..	17	27	6	4	..	54
		M.	..	..	..	..	..	..	..
		F.	1	9	9	10	2	..	31
	TOTAL		1	35	49	19	8	..	112
Appendicitis and duodenal ulcer	Indian	M.	..	..	4	1	..	..	5
		F.	..	1	..	1	..	..	2
		M.	..	..	1	..	..	..	1
		F.	..	2	..	..	..	..	2
	TOTAL		..	3	5	2	..	..	10
Appendicitis and amœbic dysentery.	Indian	M.	2	6	2	..	2	..	12
		F.	..	1	1	..	1	..	3
		M.	1	2	..	..	..	..	3
		F.	1	2	1	1	..	..	5
	TOTAL		4	11	4	1	3	..	23

of the cases of this autopsy series, where the cases revealed amœbic ulceration of the cæcum, the appendix was involved in some manner'.

In an analysis of 60 cases of amœbic dysentery made by Craig (1934), with special reference to complications, no less than 16 were found to have appendicitis.

It is probable that the real incidence of appendicitis as a complication of amœbiasis and amœbic dysentery is greater than is shown by the above data. In many cases of carriers, there is an actual invasion of the appendix by *E. histolytica* with resulting lesions. In our series, as there was not a single fatal case suggestive of amœbiasis, no post-mortem examination was possible.

Chronic amœbiasis may simulate chronic appendicitis so closely that the differential diagnosis is a matter of great difficulty. Wilkinson (1935) has made an attempt to distinguish the two conditions clinically. Many cases of

so-called appendicitis respond to anti-amœbic treatment.

TABLE III
Differential diagnosis

	Chronic appendicitis Present	Chronic amœbiasis Present
Discomfort in right iliac fossa.	Present	Present
Epigastric pain	Present	Present
Heartburn	Uncommon	Common
Alkalis	No relief	Relief
Nausea	Present	Present
Vomiting	Common	Uncommon
Pain	Localized	Diffused
Physical examination.	May be negative	Never negative
Pressure over right iliac fossa.	May cause discomfort in epigastrium or at the site of pressure.	Pain marked over cæcum and hepatic flexure; slight over sigmoid.
Liver	Not enlarged	Almost invariably affected in some degree.
Family history	Negative	Tending to family infection.

In a series of 25 operation cases (L. M. B.) in which emetine was not administered before the operation, cysts of *E. histolytica* were found in the scrapings of the appendicular mucosa in all.

Radiological investigations

It is hardly necessary to emphasize the value of radiography in the investigation of these cases. It has been our invariable practice to use both an opaque meal and enema.

The radiological study of chronic appendicitis has left the clinician in a difficult position, because the findings are not always constant. Israelski (1932) has come to the conclusion that no diagnosis of appendicitis can be made from skiagraphy alone but that the clinical picture must also be taken into consideration. In analysing divergent radiological findings Scholz (1934) enumerated certain signs recurring singly or in various combinations as more or less characteristic or suggestive of chronic appendicitis. The following scheme may be helpful :—

Direct signs

- (a) Visibility or otherwise of the appendix.
- (b) Abnormalities of situation: high, low, or retro-cæcal.
- (c) Abnormalities as to size and shape—extra long, kinked, coiled up, segmented.
- (d) Local tenderness.
- (e) Thirty-six hours' residue, concretions, adhesions, spasm.

Indirect signs

- (a) Ileo-cæcal stasis or insufficiency of ileo-cæcal valve.
- (b) Gastro-ileal reflex.
- (c) Thirty-six hours' residue in the cæcum, spastic phenomena in the cæcum or colon.
- (d) Residue in the stomach: gastric spasm.

He is of opinion that local tenderness, as elicited by palpation over the radiologically visualized appendix or the appendicular region, is a reliable diagnostic sign of appendicitis, because it enables one to make a definitely proved correct diagnosis in approximately 90 per cent of cases. He concludes that with the exception of local tenderness none of the direct or indirect radiological signs has any diagnostic value. It is worthy of note that in gastric and duodenal ulcers and especially in gall-bladder lesions a coexistent appendicular tenderness is observed frequently. Kruchen (1931) reported cases of appendicitis with typical symptoms of gastric ulcer and Moynihan states that 'most ulcers are found in the appendix'. Gross anatomical changes in the appendix, even if they

are of the most advanced type, do not manifest themselves radiologically in any conclusively characteristic manner.

According to Harnett and Galstaun (1935), non-visualization of the appendix was invariably due to obliteration of its lumen by recent or old inflammation. Felsen (1934) pointed out the importance of observing not only the malformations of the appendix by the barium enema but also any changes in the base of the cæcum. Such changes may vary from simple alteration in the mucosal outline to complete lack of filling. These show that the base of the cæcum is always involved in inflammation of the appendix and open up new possibilities in the diagnosis of chronic appendicitis.

In analysing our cases, it is not necessary to go into the technique of radiography. Our study is based on over 200 cases, examined in the School of Tropical Medicine and in the Calcutta Medical College. The findings are briefly enumerated :—

- (1) The passage of the meal through the small intestines is hurried.
- (2) The passage of the meal is delayed: gastro-ileal reflex.
- (3) Twenty-four to 36 hours' residue in the appendix: 'sluggish appendix'.
- (4) Localized spasm of the base of the appendix, cæcum or of some other parts of the large gut; stricture adhesions.
- (5) Filling defects of the cæcum, or the so-called 'moth-eaten' appearance.
- (6) Residue in the stomach.

It is therefore clear that the radiological findings are not always constant. One or more of these features may be present. The groups 3 and 5, when unassociated with other findings, are most liable to give rise to difficulties in diagnosis. From our observation of a large number of these cases we are obliged to regard the 'sluggish appendix' as pathological; and they are always associated with vague gastro-intestinal disturbances and sooner or later are liable to flare up. The appendix is therefore best removed. Cases in group 6 are usually mistaken for duodenal ulcer or, as a matter of fact, they are often associated with amœbiasis. The following case may be of interest :—

Case III.—The patient, aged 28, a dispensing chemist, was admitted into the Prince of Wales' Hospital with a diagnosis of a duodenal ulcer, which was confirmed by skiagraphy. Appendix—negative. He gave a history of recurrent attacks of amœbic dysentery. The last attack was followed by exacerbation of gastric symptoms, which he ascribed to oral administration of amœbicides. He was placed under Sippy treatment in the hospital, but five weeks later he developed acute appendicitis. The appendix was removed under general anaesthesia and the subsequent recovery of the patient was rapid and uneventful.

A few illustrative skiagrams are shown (*vide* plates VIII, IX and X).

PLATE VIII



Fig. 1.—Stomach, hypersthenic. Duodenal cap, deformed. Appendix long—slight residue 24 hours. Large intestine—general spasticity (12 hours).

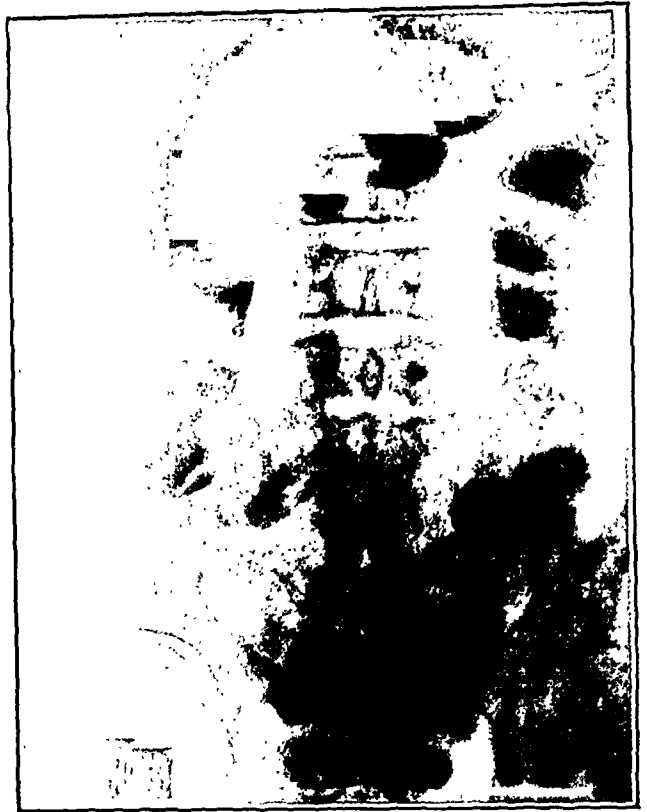


Fig. 2.—Stomach, dilated—residue after 24 hours. Appendix, residue. Large intestine—dilated, haustrations poor.



Fig. 3.—Stomach, hyperperistaltic type—residue after 12 hours. Duodenal cap—deformed (duodeno-jejunal obstruction). Large intestine—irregular filling and haustration.

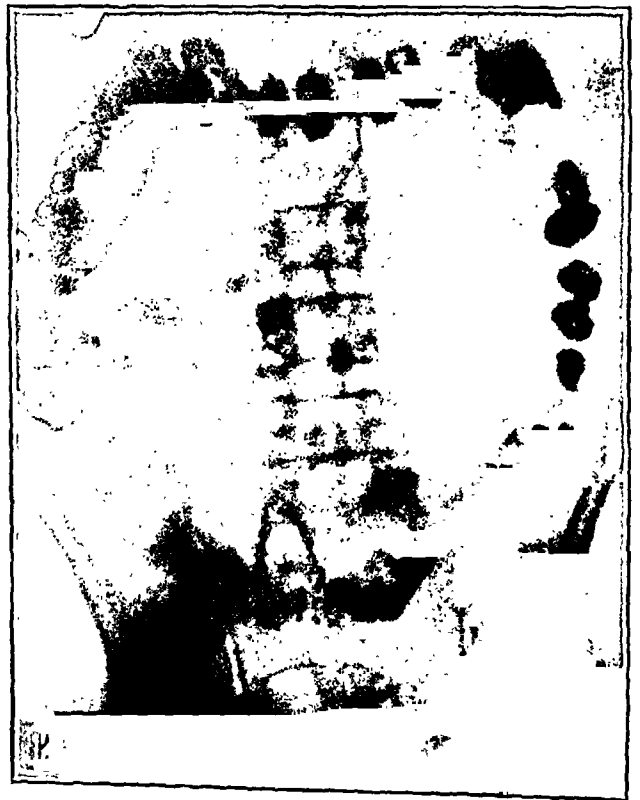


Fig. 4.—Stomach, residue 6 hours. Appendix—visualized at 12 hours. Large intestine—spasticity of distal arm.

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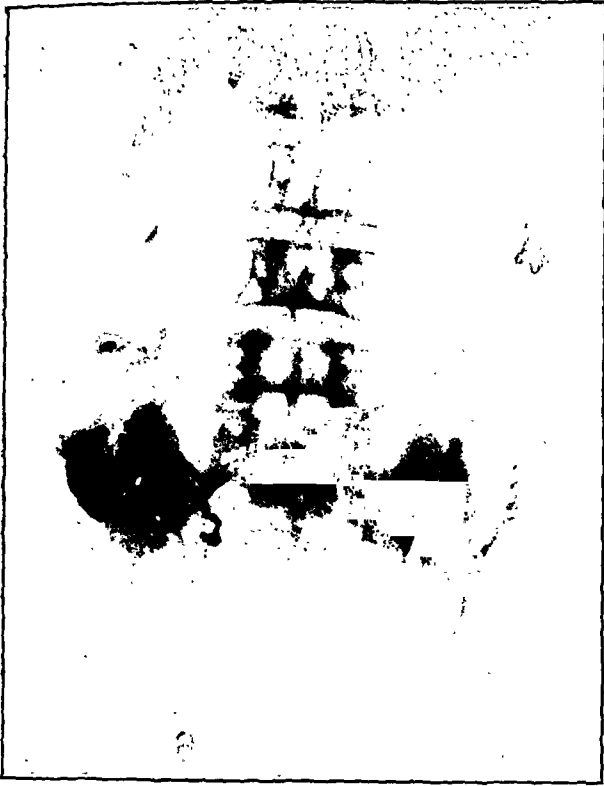


Fig. 7a.

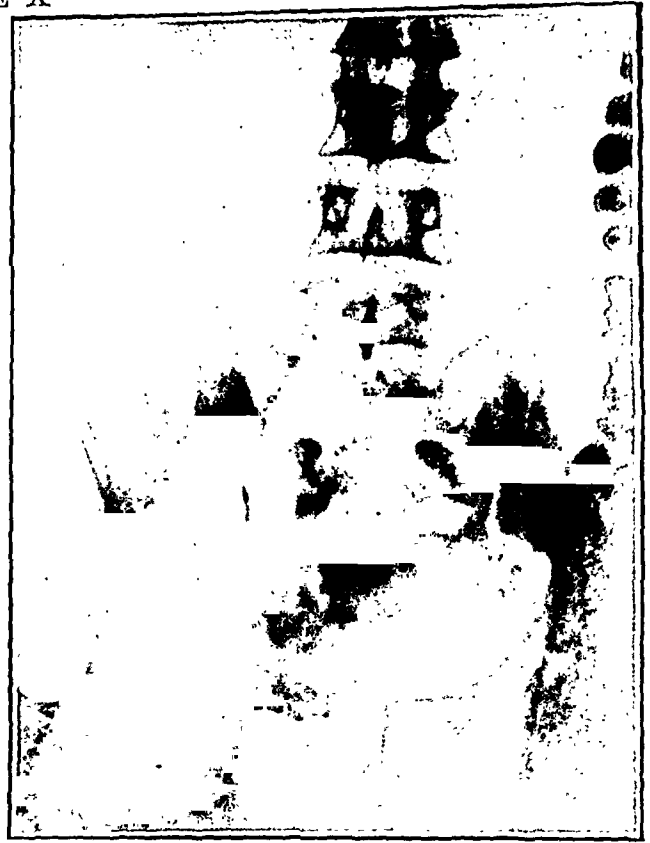


Fig. 7b.



Fig. 7c.

Figs. 7a, 7b and 7c.—Appendix, seen 12 hours; residue 48 hours.

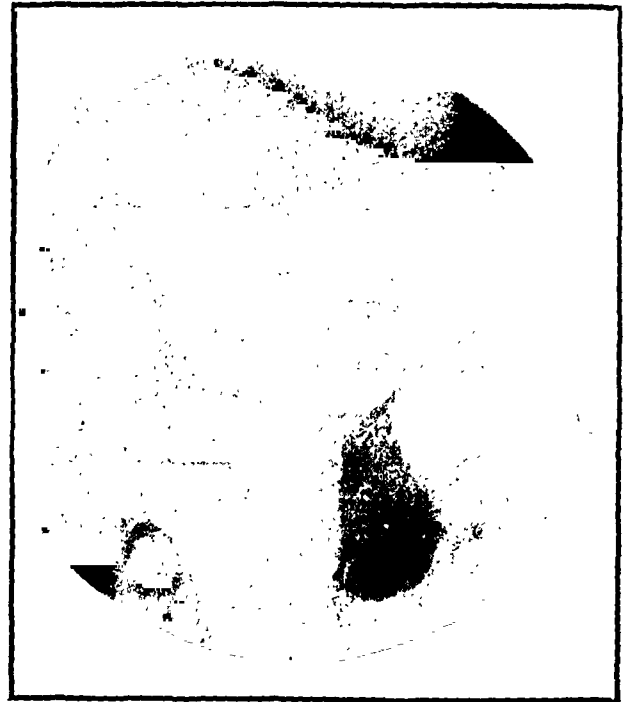


Fig. 5a.

Fig. 5b.

Figs. 5a and 5b.—Duodenal cap—tender. Appendix—long and coiled.



Fig. 6a.

Fig. 6b.

Figs. 6a and 6b.—Stomach, slightly dilated; 6 hours' residue. Small intestine, residue intermediate coils 12 hours. Appendix, residue at 48 hours. Large intestine, irregular filling. Transverse colon, spastic 24 hours.

Small intestine—delay in terminal coils. Appendix—dilated, residue 24 hours. Large intestine—spastic pelvic colon.

Small intestine—residue 6 hours. Appendix—partly retro-cæcal, residue 24 hours. Ascending colon—spastic.

TABLE IV

Analysis of radiological findings in 100 cases of appendicitis

<i>Stomach</i>			
Hypersthenic	..	..	10
Dilated	..	..	10
Residue at 6 hours	..	..	25
Residue at 12 to 24 hours	..	..	15
Ulcer	..	..	..
<i>Duodenum</i>			
Deformed cap	..	..	20
Tenderness	..	..	5
Ulcer	..	..	5
<i>Gastro-ileal reflex</i>			
Positive	..	..	25
<i>Appendix</i>			
Residue at 48 hours	..	..	34
Tenderness	..	..	90
<i>Large intestine</i>			
Spastic	..	..	40
Dilated	..	..	15
Rapid emptying	..	..	15
Malformation base of cæcum	..	..	30

III. Pericæcal cellulitis and appendicular abscess

Perityphlitis and pericolicitis undoubtedly occur as a complication of chronic amoebiasis; the former is usually diagnosed as chronic appendicitis or appendicular abscess. In such active cases of amoebiasis, the parasite can usually be found in the faeces. The specific treatment should first be used to cut short the pathological process (Rogers and Megaw, 1935). Pericæcal cellulitis is not uncommon. The following case is of interest in this connection :—

Case IV. Pericæcal cellulitis.—The patient, aged 25, was admitted into the hospital with a painful lump in the right iliac fossa. Duration—11 days. Clinically, the diagnosis was appendicular abscess. Locally, there was pitting on pressure and on rectal examination; boggianness was definite. The operation was performed as for an appendicular abscess. The region was markedly oedematous and on deepening the incision a very offensive odour was noted. Gaseous crepitation was also present. Drainage was established in the usual way. Anti-gas-gangrene and anti-streptococcal sera were administered. A history was obtained that the patient had had an attack of dysentery only three weeks previously. When the fulminant symptoms subsided a course of emetine treatment was instituted. The patient made an uneventful recovery.

It is a matter of gratification that such fulminating cases are infrequently met with. In most cases, the symptoms are milder and the cæcal lump forms more slowly and may persist for months. It is remarkable that such swellings completely subside under emetine. Adhesions are readily formed, localizing the collection of pus. This is the type of case that is commonly confused with tuberculous disease of the cæcum, or occasionally with carcinoma. Skia-graphy, which is so valuable in most cases, may completely fail to elucidate the condition. The following case illustrates this :—

Case V.—The patient, a lady of 26, was admitted into the Prince of Wales' Hospital with a lump in the right iliac fossa. Duration—six months. The symptomatology consisted of indigestion, recurring attacks

of diarrhoea, vomiting, irregular pyrexia and dysmenorrhœa. The differential diagnosis lay between recurrent appendicitis, tuberculous disease of the cæcum and a tubo-ovarian mass. The patient had two attacks of dysentery, nine months ago. The appendix was found to be buried in dense adhesions, and microscopically it showed chronic inflammatory changes.

Carcinoma of the cæcum is comparatively rare in Calcutta, and it is worthy of note that fixity of the cæcum is more in favour of an inflammatory condition. Perforation of the descending colon, sigmoid, or rectum may lead to formation of large inflammatory swellings in the left side of the pelvic cavity. They are comparatively rare, because general peritonitis is more likely to result from the perforation of the large intestine in this region. The following case of acute diverticulitis or a left pericolic cellulitis is a good example :—

Case VI.—The patient, aged 20, was admitted into the hospital with a lump in the left iliac fossa. Duration—15 days. The history was obtained that he had suffered from several attacks of dysentery during the past few years. The present illness started with hepatitis, jaundice, and diarrhoea. With administration of emetine, the condition continued to improve but he developed a lump in the left iliac fossa. On local and rectal examinations, definite pitting on pressure was found. An incision was made over the region and pericolic cellulitis with escape of offensive gas was discovered. The case terminated fatally but no post-mortem examination was permitted.

One has to confess that the diagnosis of these cases is beset with many difficulties. Dysenteric perforations of the large gut are not uncommon in emergency surgery. Although an escape of foul gas is noticed much difficulty is generally encountered in locating the site of the lesion owing to the absence of 'sizzling' or escape of fluid. It seems that the amoeba can perforate the wall of the large gut with such facility and rapidity that sufficient time is not allowed for the formation of peritoneal adhesions. In some cases, even in the apparently healthy individual, perforation may occur causing sudden death.

On the other hand, pericæcal or pericolic adhesions may persist as unpleasant sequelæ. In cases of amoebic colitis which are not making satisfactory progress, radiological control is important, not only for the purpose of locating the intestinal ulcers as accurately as possible, but also for determining the presence of old thickening resulting from chronic amoebic dysentery, and also perhaps of dysenteric adhesions, which are amenable to operative treatment (Menk, 1929). This type of case may closely simulate the so-called appendicular dyspepsia.

IV. Appendicular dyspepsia or neurasthenia

Experienced observers are agreed with regard to this distressing and intractable condition. The symptomatology is usually very indefinite and may consist of any or all of the following complaints—progressive weakness, lassitude, muscular wasting, anæmia, irritability of temper,

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Hypersthenic	10		
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IV. Appendicular dyspepsia or neurasthenia

Experienced observers are agreed with regard to this distressing and intractable condition. The symptomatology is usually very indefinite and may consist of any or all of the following complaints—progressive weakness, lassitude, muscular wasting, anæmia, irritability of temper,

sleeplessness, chronic indigestion and biliousness. The condition is frequently diagnosed as 'sluggish liver' or gastritis. The response to medical treatment is not always encouraging. The radiological examinations may reveal a 'sluggish appendix' with a residue after 36 hours. A great deal of care and discrimination is needed in the selection of these cases for operative treatment, because it may not completely relieve the vague abdominal discomfort and pain. A type of flatulent dyspepsia may be intractable to all treatment. In such conditions, change of residence and spa treatment may bring about some improvement.

Summary

This review is based on the clinical study of 475 cases of appendicectomy and the radiological study of 200 cases of appendicitis exclusive of cholecystitis, which will be dealt with in a subsequent paper.

(1) The incidence of amœbiasis associated with appendicitis was 5 per cent. There was a positive history of dysentery within a period of 12 months in 45 per cent of cases. In 56 per cent of cases, a course of emetine treatment was carried out by the medical attendants with apparent benefit, before the patient was admitted into the hospital.

(2) In a series of 25 private cases, in which no emetine was administered before the operation, cysts of *E. histolytica* were found in the scrapings of the appendicular mucosa in every case.

(3) Clinically, the cases of chronic amœbiasis showed marked pain over the cæcum and hepatic flexure, and slight pain over the sigmoid. The liver was almost invariably affected to some degree. There was also a tendency to family infection. Leucocytosis in these cases seldom exceeds 18,000. There is an eosinophilic count varying between 5 to 10 per cent.

(4) Sigmoidoscopy is a valuable diagnostic aid in this type of case. In 28 consecutive cases, stools were positive for cysts in 11 and parasites were present in the scrapings in 3. Ulcers were present in 25 cases and stricture in 6. The therapeutic test with emetine was positive in 2 cases. There were 12 cases of non-specific colitis.

(5) The pathological report showed inflammation of the submucosa with some fibrosis. The typical amœbic ulceration is rarely met with, on account of the general practice of pre-operative exhibition of emetine. There is no doubt that colonic lesions are readily amenable to this treatment, but patients are liable to subsequent attacks of appendicitis, either as a result of inflammatory changes in the appendix or the recurrence of amœbic lesions in the appendix.

(6) Diet does not appear to have any definite bearing on the incidence of appendicitis. It is fairly evenly distributed among both vegetarians and non-vegetarians.

(7) The radiological signs are not always constant. In our opinion, the 'sluggish appendix' is pathological and ought to be removed. Of the direct signs, local tenderness, as elicited by palpation over the radiologically visualized appendix or the appendicular region, is a reliable diagnostic sign in approximately 90 per cent of cases. Of the indirect signs, malformation of the base of the cæcum after a barium enema is valuable and dependable. Such changes may vary from simple alteration in the mucosal silhouette to complete lack of filling.

(8) The radiological findings have been summarized.

(9) A careful analysis of this group of cases leads one to advocate the Ochsner-Sherren method of treatment with administration of emetine. An 'interval' appendicectomy is performed in every case. In a consecutive series of 400 cases, there was only 1 fatal case, yielding a rate of mortality of 0.25 per cent.

(10) Pericæcal cellulitis and appendicular abscess undoubtedly occur as a complication of chronic amœbiasis. In active cases of amœbiasis, the parasite can usually be found in the faeces; the specific treatment should first be used to cut short the pathological process.

(11) With regard to appendicular dyspepsia or neurasthenia a great deal of care and discrimination is needed in the selection of cases for operative treatment.

In conclusion, we wish to acknowledge our indebtedness to our many colleagues for their valuable help. To Dr. G. Galstaun, Honorary Radiologist of the Medical College Hospitals, and to Lieut.-Col. J. A. Shorten, I.M.S. (retd.), Honorary Radiologist of the School of Tropical Medicine, our best thanks are due for the skiagraphy. We also wish to thank Dr. M. N. De, Professor of Pathology of the Medical College, and Capt. C. L. Pasricha, I.M.S., of the School of Tropical Medicine, for the pertinent laboratory data.

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THE SPECIES CONTROL OF ANOPHE-
LINES IN INDIA

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and

G. MACDONALD, M.D., D.P.H., D.T.M.

Introduction

THE discovery of the mosquito malaria cycle by Major (later Sir) Ronald Ross raised the hope that in thirty years malaria would be a disease of the past, at least in so far as it dominated life in the tropics. That hope has proved unfounded because the control of mosquitoes in general, and anophelines in particular, appeared to many to be too vast a task, and practically no use has been made of the fact that, in any one area, there is rarely more than one species of anopheline requiring control.

It is only in recent years that this fact has been appreciated and made use of on a large scale in malaria control in India. The habits of one Indian species have now, however, been studied in great detail and the knowledge thus gained utilized in its control. Efficient control on biological lines has been instituted on a large proportion of the tea plantations of northern India, which had previously suffered particular loss as the result of the importation of large numbers of labourers who are not immune to malaria.

The relative ease with which excellent results have been obtained, largely through biological means of control, has led us to collect such information as we can about the other known carriers of malaria in India, to show on what lines their control might develop and which are the gaps in our knowledge which most urgently need to be filled.

We have intentionally avoided all reference to work done outside India, because experience has shown that observations made in one place are not necessarily true in another. This has been shown for many species, such as *A. maculatus* in Malaya and India, for *A. philippinensis* in the neighbouring provinces of Assam and Bengal, and for *A. maculipennis* in an even smaller range in Holland. We have therefore attempted to avoid some of the pitfalls by restricting ourselves to India, though fully aware of the possibility of pitfalls within that continent.

Shortly after Ross' discovery in 1898, the Royal Society appointed a Commission to repeat

and amplify his observations. Stephens and Christophers (1902), members of the Commission, showed by dissections of wild specimens, and by epidemiological evidence, that in India *A. subpictus* was not a carrier of malaria, whereas *A. culicifacies* and *A. minimus* appeared to be of importance. They named a group of anophelines as eminently the carriers of malaria and described their breeding places in detail. Efforts to devise effective anti-larval measures failed in a subsequent experiment carried out in a cantonment near Lahore, after which interest in India seems to have slackened for some years. During this time Watson, working in Malaya, showed clearly the different importance of different species, advanced the idea of biological control and devised measures of control appropriate to several species. This was the first definite enunciation of the idea of species sanitation and Watson was the first to grasp the idea of employing nature to control anophelines and eliminate malaria.

Research did not, however, come to a complete standstill in India. In 1907 Christophers was sent to northern Bengal to investigate the severe malaria and blackwater fever from which the tea industry suffered, and was afterwards joined by Bentley. They gained much useful knowledge, and their recommendation that non-immune people living in a hyperendemic area should take quinine regularly has been of the utmost value to those districts, but again appropriate anti-larval measures were not devised. The great Punjab malaria epidemic of 1908 roused public interest again, Christophers was sent to investigate it, and a Central Malaria Committee was formed. The report by Christophers (1911) was, with the possible exception of that by Dempster (1848), the most important that has appeared on malaria in the Punjab, and greatly increased our knowledge of epidemic malaria, while the Central organization remained and eventually developed into the Malaria Survey of India. During the revival of research which followed, *A. stephensi* was incriminated as a carrier by Bentley (1911) in Bombay; *A. sundaicus* (*A. ludlowii*) by Christophers (1912) in the Andamans; *A. fluviatilis* (*A. listoni*) by Perry (1914) in the Jeypore hill tracts of Madras, and a considerable amount of negative evidence was secured about other species.

During the war the volume of work diminished, and the next spurt did not appear until about 1924. It was produced by a number of factors. Sir Malcolm Watson was invited to investigate the health of a number of tea plantations in Assam and instituted the first large scale control experiment to be undertaken on plantations in India. Interest in malaria control and the benefits to be gained from it was aroused, and Ramsay undertook an investigation of the malaria problems of Cachar; the Malaria Survey of India stimulated interest by

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its teaching, and the series of monographs which came from its staff on the infectivity and distribution of anophelines in India, and the bibliography of malaria in India supplied a foundation on which new work could be built.

Another great increase in research work on malaria followed. In 1927 Covell had recorded the results of the dissection of some 23,000 anophelines in India; when he brought his records up to date in 1931 he was able to record the results of a further 100,000 dissections in India. To-day, without pretending to completeness, we have before us the results of over a quarter of a million dissections made since 1931.

There are forty-three species of anophelines in India, in twelve of which natural infections with sporozoites have at some time been found. We propose to discuss nine of these species, which are believed to be of some importance in the transmission of malaria, in some detail, describing the evidence on which they have been incriminated, their distribution, their bionomics, and the methods by which they might be controlled. We consider three of the twelve species in which natural sporozoite infections have been found, *A. ramsayi**, *A. maculatus* and *A. vagus*, to be quite unimportant, or without evidence to prove their importance, and will not discuss them.

In compiling records of dissections we have made great use of two papers by Covell (1927b and 1931) for records prior to 1931; the sources from which records of dissections after that date have been taken are listed in a separate bibliography at the end of this paper. The descriptions of the geographical distribution of species are taken entirely from Covell (1927a) and Barraud (1933) to whom we wish to make full acknowledgment.

THE *Anopheles minimus* GROUP

Anopheles minimus Theobald

The chief centre of this species in India is the north-eastern corner, Assam, Bengal and Burma, but there are records of collections in

*[Fauna of British India, Diptera, Vol. IV. Christophers (1933) gives *Anopheles ramsayi* Covell, 1927, as a species, and *A. pseudojamesii* Strickland and Chowdhury, 1927, as a synonym. The reason for this is that Covell's description was published in the *Indian Journal of Medical Research* in the April 1927 number, whereas Strickland and Chowdhury's description appeared in the May 1927 number of the *Indian Medical Gazette*. There is therefore a *prima facie* case for the former name.

However, some years ago a letter was issued by the publishers of both these journals, Messrs. Thacker's Press and Directories, Ltd., stating that the actual day of publication of the April 1927 number of the *Indian Journal of Medical Research* was 15th May, whereas the May number of the *Indian Medical Gazette* was issued on 10th May.

These are the facts of the case, but discussions regarding nomenclature priority are beyond the scope of this journal.—EDITOR, I. M. G.]

Malabar, Vizagapatam, Konkan, the Madras Coast and the eastern United Provinces. It was originally named as a vector of malaria by Stephens and Christophers (1902) who found 4 infected out of 64 dissected, but after this observation the species was almost entirely neglected for twenty-four years. We have now the results of 38,312 dissections, in 881 of which sporozoites were found.

All the positive findings have been in Assam and Bengal, in which provinces there has been only one considerable series of negative dissections, that by Timbres (1935), who dissected 340. In the district in which he worked *A. minimus* was relatively rare, and its maximal seasonal incidence was in the cold weather, which probably explains the negative findings. It is certainly the most important vector of the whole of Assam and of northern Bengal.

Breeding places.—The type of water chosen by *A. minimus* was briefly described by Stephens and Christophers, and has been the subject of careful study by Ramsay (1930a) and Manson and Ramsay (1932). It breeds in fairly clear water, slowly running or stagnant, with grassy edges, exposed to sunlight or under only partial shade. It does not select as breeding places water which is highly contaminated with silt, clay in suspension, iron oxide, bacteria, or thickly covered with a scum of surface algæ. It does not breed in water covered with dense shade, or channels where there is a high velocity of current unless there are bays or pockets protected from the main current. It apparently prefers that the water should be cool, because it is rarely found in the shallow unshaded stagnant water in fallow rice fields, but is commonly found in them when the water is supplemented by cool seepage water, or it may be found in quite stagnant shallow water during the cooler seasons of the year.

In most places where it occurs it appears to have two distinct types of breeding places, one for the dry weather and one for the monsoon. In the dry weather it is to be found at the edges of slowly running rivers. When these become unsuitable owing to floods, which are detrimental to the larvæ both on account of their velocity and of the silt carried in suspension, *A. minimus* leaves them and chooses the clear grassy streams and seepages which then appear in profusion, or the slowly moving water in drains, irrigation channels or irrigated rice fields.

There are districts, notable in northern Bengal, where no suitable dry weather breeding grounds are to be found. We know of tea plantations on the gravel bed at the foot of the Himalayas round which no water of any sort can be found during the dry season for a radius of five miles, during which season the species apparently disappears entirely. When surface water reappears, larvæ of *A. minimus* immediately reappear in enormous numbers. Researches on the mechanism of this reinfection

of monsoon breeding places, whether by wintering adults which have survived from the previous year or by adults which have flown considerable distances, are being carried out. It is certainly not always by larval infiltration in rivers, as we know of several instances where this possibility can be excluded.

Seasonal distribution.—This is a warm weather species whose rate of multiplication would seem to depend entirely on the temperature and the availability of suitable breeding places. During the winter, when the minimum temperature falls below 60°F., breeding occurs, but very slowly. Rice (1935) noted oviposition in the

Whenever differential house and cowshed counts have been made in Assam, substantially similar results have been secured. Manson and Ramsay found that it constituted 54.7 per cent of the total house catch and only 1.6 per cent of the total cowshed catch. In Bengal, however, Timbres found that it was about equally common in the two. Ramsay (1930b) has noted that in Assam *A. minimus* is reluctant to take blood at temperatures below 60°F., and, as Timbres' specimens were mostly caught in the cold weather, it is possible that they were attracted to cowsheds rather by their warmth than by the nature of the food obtainable there.



Fig. 1.—Double hedge of dharanta effectively shading a stream.

cold weather, but of 192 eggs laid only 23 developed into adults, and the average time taken for development was 30 days. The season at which suitable breeding places are to be found varies from place to place, so that in some areas the maximum incidence is in the monsoon, in some immediately before it, and in some immediately after.

Feeding habits.—Ramsay, Chandra and Lamprell (1936) examined by the precipitin method the blood meals of 622 specimens, in 562 of which they were able to arrive at a definite diagnosis of the source of the meal. Human blood, alone or together with ruminant blood, was present in 533, and the androphilic index was 85.7 per cent.

Methods of control.—The biological requirements of *A. minimus* have been sufficiently studied to make its control a matter of relative ease. We have formulated its requirements as clear relatively-cool water exposed to sunlight and containing vegetation. It is usually easy so to modify the characteristics of a breeding place as to make it unsuitable. Shading of streams or swamps by hedges or swampy vegetation sufficiently thick to eliminate the growth of grass or other chlorophyll-containing plants is invariably successful in preventing breeding, and this is the method which we most commonly use. Narrow streams may be protected by a double hedge of dharanta, eupatorium, lantana, bougainvillia, or bahok, such as that shown in

figure 1. Swamps may be planted with a dense growth of tarapat, or similar vegetation, as shown in figure 2, or the edges of tanks may be shaded with bamboo matting as shown in figure 3. Breeding in depressions in the surface of the ground is controlled by filling in, or by contamination of the water with locally-cut jungle or domestic refuse. A method which has been found of great value in narrow valleys in which the central stream and the lateral seepages form extensive breeding grounds is to convert the whole into a series of lakes by means of small dams; breeding at the periphery of these lakes

each week in order to allow the channels to dry out. Where only small areas are under cultivation, and the economic loss is therefore small, we have encouraged the closure of irrigated rice fields, and the substitution of a dry crop, in the immediate vicinity of coolie lines. Where geological conditions permit we advocate vertical drainage through an aperture in the superficial impermeable stratum into the permeable strata below.

The attractive suggestion has been put forward, originally by Ramsay (1927) and later by Rice (1935), that advantage might be taken



Fig. 2.—Swampy vegetation, chiefly tarapat, producing effective shade.

is controlled by periodical alterations in the water level by means of sluice gates.

The vast seepages of northern Bengal form enormous breeding grounds for *A. minimus*; at times so enormous that site selection, the removal of lines from the dangerous vicinity, is the only control method of any value. We like to deal with smaller seepages by adequate contour draining associated with shading of the drain, because this method reclaims good land and is easily maintained on a large scale.

Where rice or other crops are irrigated the channels form dangerous breeding grounds. We find that it is possible to control these by shutting off the irrigation water for a day or so

of the seasonal change of breeding place at the break of the monsoon to control this species. The suggestion is that it should be possible, by intensive control in the cold weather, so to reduce the number of adults available to oviposit in the monsoon breeding places as to prevent breeding in the latter and make their control unnecessary. This suggestion has been given a practical trial and found useless by Ramsay (1930a). The monsoon breeding places became infested despite the most rigorous dry weather control. The problem is the same as that of the monsoon appearance of larvæ in areas which are completely dry in the cold weather, and has been fully discussed by Macdonald (1936).

Anopheles fluviatilis James

This species is widespread throughout India. It was first found 'infected in nature' by Robertson (1910), and details of positive infections were given by Perry (1914). We have records of 9,511 dissections, in 37 of which sporozoites have been found. These numbers probably greatly under-estimate its importance as a vector of malaria, as there is reason to doubt one series of over 6,000 dissections, of which only one was positive. Measham and Chowdhury (1934) found a sporozoite rate of 6.4 per cent among 203 wild specimens dissected.

Records of positive dissections, in which sporozoites were found, have been made in the United Provinces, Madras, Mysore, Travancore and Coimbatore, while one, which only doubtfully refers to this species, comes from Assam. Gut infections have twice been recorded from the Punjab. There is no reason to suggest that it is not an important carrier wherever it occurs. On

TABLE I

Average weekly catch of *A. fluviatilis* in Patiala (Punjab), adapted from Covell (1932b)

May	..	38	Sept.	..	26	Jan.	..	105
June	..	28	Oct.	..	147	Feb.	..	128
July	..	53	Nov.	..	104	Mar.	..	180
Aug.	..	30	Dec.	..	95	Apr.	..	234

As a result it is chiefly important as a carrier of malaria in the pre-monsoon and post-monsoon periods, transmission in the winter being inhibited by low temperatures. Thus, Covell found infected specimens during September, Measham found them in April, May and June, and Nursing, Rao and Sweet (1934) in April, May, November and December, and came to the conclusion that, in parts of Mysore at any rate, *A. fluviatilis* alternated with *A. culicifacies* as a carrier in different seasons.

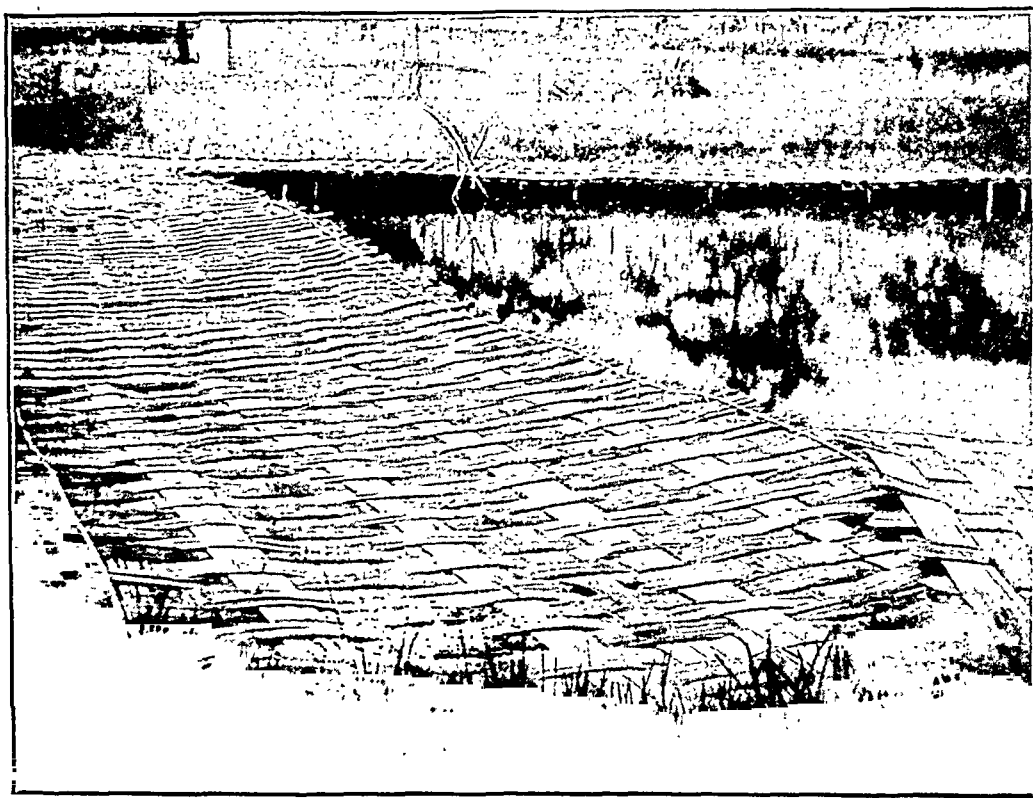


Fig. 3.—Bamboo matting shading the edge of a tank.

account of its preferential breeding places it is most important in sub-montane regions, such as the Himalayan foot-hills, and the hills of southern India.

Breeding places.—*A. fluviatilis*, which is systematically closely related to *A. minimus*, chooses very similar breeding places, except that it cannot maintain itself against quite the same velocity of current as can the latter. With this exception the description of the breeding places of *A. minimus* applies to this species.

Seasonal distribution.—The seasonal distribution differs from that of *A. minimus* in that it is not so susceptible to the effects of cold as that species, and appears in places to have a definite preference for the cooler months of the year, which is accentuated when its breeding places are made uninhabitable by monsoon floods. In the Punjab it certainly persists in numbers throughout the whole cold weather, and shows a decrease in the extreme hot weather and monsoon, from May till September (see table I), and a similar distribution is noted in the south of India.

Feeding habits.—*A. fluviatilis* appears to have a distinct preference for human habitations and bites man readily. Perry found that it constituted 86 per cent of his total house catch and 4 per cent of his catch in cowsheds. Similarly Measham found it constituted 58 per cent of the total house catch and 0.5 per cent of his catch in cowsheds.

Control.—Owing to the great similarity between the habits of this species and those of *A. minimus*, identical control measures are applicable and have been proved successful.

Anopheles varuna Iyengar

Anopheles varuna, which occurs in the United Provinces, Bihar and Orissa, Bengal and the coastal regions of peninsular India, has been found infected in the salivary glands once by Iyengar (1928) in Bengal out of 326 specimens dissected, though gut infections have been found in Mysore and Travancore. Its importance

as a vector is not fully established, but its close systematic relationship to *A. minimus*, and these few positive findings, make it the subject of suspicion wherever it occurs. More work on this species is obviously needed.

Breeding places.—It is usually found breeding in water similar to that favoured by *A. minimus* or in wells; it probably also resembles this species in seasonal distribution and feeding habits. Similar control measures are therefore indicated.

Anopheles culicifacies Giles

This species is widespread throughout India except the Andaman Islands. It is a very common rural mosquito except in the extreme north-east. The first discovery of sporozoites in its salivary glands was made by Cornwall (1902). Out of a total of 24,187 records of dissections up to date, 170 have shown sporozoites in the salivary glands, and 408 oöcysts in the gut. At times very high sporozoite rates have been found, and for a short time during an epidemic in Sind, Covell and Baily (1932) found a sporozoite rate of 30 per cent.

Specimens infected in the salivary glands have been found in the Punjab, United Provinces, Central Provinces, Bombay, Madras, Sind, Travancore, Malabar, Mysore, Burma and Assam. *It is believed to be an important vector throughout India, except in Bengal and Assam. But recently Senior-White in an infectivity survey in the Jeypore Hills has shown that it appears to be of little or no importance there. It has almost certainly been responsible for the great epidemics which have in the past periodically devastated north-western India.

Breeding places.—*A. culicifacies* is an adaptable species which can accommodate itself to a wide variety of water conditions. We have found it in the Punjab in dirty cattle ponds, in muddy borrow pits, and in roadside drains, and Chalam (1926) has reported it from saline waters consisting of 25 per cent of sea water, but in these types of water it is only occasionally found and never in important numbers. It seems to prefer weedy pools, shaded by trees, or water slowly flowing through tufts of grass; or irrigation channels in which, if the banks have bays and are grassy, it can maintain itself in water with a considerable central velocity. Other favourite places are pools in the beds of irrigation channels and streams, and the grassy edges of creeks of big rivers. Macdonald and Majid (1931) made the epidemiological observation in the Punjab that only these preferential breeding places had any effect on the intensity of malaria in a village, the spleen rates always being low in the absence of these particular types of water.

The distribution of water of this type in the great plains of India is largely controlled by irrigation; directly, in that irrigation channels form ideal breeding places, and, indirectly, in that excessive irrigation, by raising the level of

the subsoil water, favours the production of just that type of swamp in which *A. culicifacies* abounds.

Seasonal variation.—Throughout northern and peninsular India *A. culicifacies* may be found at all seasons, except perhaps during the two coldest months of the year, and it markedly increases in numbers during the monsoon. In north-eastern India it has a different seasonal incidence, breeding freely during the dry season from November until April, and disappearing almost completely on the break of the rains. This is apparently because it is there only adapted to one type of breeding place, the grassy banks of slowly flowing rivers, or pools in their courses, which become untenable when flooded.

Feeding habits.—*A. culicifacies* appears to be indiscriminate in its habits, with at most only a slight preference for human habitations over cowsheds as resting places. Timbres (1935) in Bengal found that in night catches it was roughly equally common in houses and cowsheds, though more common in houses by day. Ramsay, Chandra and Lamprell (1936) investigated the blood meals of 19 *A. culicifacies* by the precipitin method, in 9 it was found to be human and in 10 ruminant. The counts made by Perry (1914) in houses and cattle sheds differed so much in total numbers that it is difficult to compare them, but they were clearly not more common in houses than in cowsheds.

Control.—We have already noted that there is a particular type of water in which this species breeds most freely, and that it is only in the presence of this type of water that sufficient breeding occurs to produce a notable effect on the transmission of malaria. The control of *A. culicifacies* is the control of swamps, irrigation channels and streams, and the pools in their beds. Throughout a large area of India these types of water are produced almost exclusively by irrigation, and a vigorous Government policy aimed at the prevention of over-irrigation, the prevention of leakage of water from canals by waterproofing their beds, and the drainage of areas in which the subsoil-water level has been allowed to become too high, would be more than repaid by a saving of water, by an improvement in the fertility of waterlogged lands, as well as by a marked reduction in seasonal and epidemic malaria.

General measures of this type, without detailed attention to individual breeding places, should produce a great improvement in the health of rural areas. Where canals approach towns or large villages, more detailed work is advisable. We believe that the main canals or main distributaries can be made harmless by clearing vegetation from their banks, and that some method of waterproofing should be adopted in them to prevent leakage from them. The smaller watercourses, in which the velocity of the current is less, can be dealt with by periodical drying. Should objections be raised

* Personal communication.

to the removal of vegetation, on account of erosion, or to periodical drying, the only alternative is the duplication of channels to allow periodical drying of one channel, combined with the provision of larval traps to prevent infiltration of larvæ (alternate irrigation).

For the reduction of *A. culicifacies* in southern India, we know of no method of indirect attack. The direct methods of flushing, oiling, draining, and filling in are the only ones at present available. In many cases where breeding is practically confined to rocky pools in river beds, a combination of site selection and oiling is to be preferred, as the breeding season is usually short, and monsoon floods often ruin permanent measures carried out in the river bed during the dry season.

Anopheles sundaicus Rodenwaldt

A. sundaicus is limited in India to the Andaman Islands, the coastal regions of Burma, Lower Bengal, and Madras. It has recently shown signs of spreading in Lower Bengal, and has invaded the environs of Calcutta. Christophers (1912) demonstrated on epidemiological grounds, and by the discovery of oöcysts in the gut, that it was an important vector in the Andaman Islands, the first discovery of sporozoites in wild specimens in India being made by Covell (1927c). A total of 1,593 have now been dissected, and sporozoites found in 175.

All the discoveries of naturally infected specimens have been made in Bengal and the Andaman Islands. Very high sporozoite rates have been found; Iyengar (1931) found sporozoites in 8.5 per cent of 836 specimens dissected and a total infection rate (including gut infections) of 23.4 per cent. There is reason to believe that it is a dangerous vector wherever it occurs.

Breeding places.—*A. sundaicus* differs from other Indian species in its marked preference for brackish water; this determines its coastal distribution. Its preferences have been the subject of careful study by Iyengar (1931) and Neogi (1936). The larvæ are to be found usually in water of all degrees of salinity from 50 to 250 parts NaCl per 100,000, and have been found in concentrations as high as 1,800 parts per 100,000 (Covell, 1932). The latter figure represents roughly a one-in-three dilution of sea water in fresh water, and its optimum salinity a one-in-twenty dilution. As a result it is found breeding in coastal areas, and largely in natural or artificial basins in which tidal water and fresh water intermingle, partially cleared mangrove swamps, and the Salt Lakes of Calcutta. A predilection for water with some organic pollution has also been stipulated, but Neogi has shown by careful statistical analysis that it can utilize polluted water, but that there is no true preference for it. The apparent correlation is in reality a correlation between salinity and pollution.

Apart from its preference for brackish water, *A. sundaicus* selects water containing algal growths—a fact which has been made use of in control in other parts of the world, destruction of the algal growths by temporary drying resulting in prolonged cessation of breeding—and does not breed in the dense shade of uncleared mangrove swamps.

Seasonal distribution.—*A. sundaicus* breeds throughout the year, its coastal resorts being normally perennially warm. Breeding is apparently directly controlled by the temperature and the prevalence of suitable breeding places, with the result that it is most numerous during and immediately after the rainy season.

Feeding habits.—The species is a well-known house-lover and feeds readily on man.

Control.—The natural requirements of this species for breeding purposes are brackish water (usually a mixture of sea water and fresh water) containing surface algæ, and exposed to sunlight. The cardinal measures to be taken to avoid increase of the species in a new coastal settlement are to avoid destruction of mangrove swamps within half a mile of dwelling houses, and to avoid measures, such as the construction of fishing ponds at high-spring-tide level, which will result in a mixing of fresh and sea water, either of which alone is safe. Where such intermingling naturally occurs it may be prevented by construction of embankments, proofed against crabs by the petioles of palm trees ('ejuk'), with sluice gates which allow the passage of fresh water at low tide and produce a periodical 'flushing' effect. It may also be possible at times to dilute brackish water with either salt or fresh water, making it unsuitable by either an excess or deficiency of salt.

A method which has been used elsewhere on a wide scale where *A. sundaicus* breeds extensively in coastal fish ponds is the destruction of surface algæ by periodical temporary drying. The surface algæ are eventually replaced by deep algæ, and the commercial value of fish ponds is retained. Silt has also been recommended for its deterrent action, though we have no personal experience of it, and it has been proposed to make use of this by pouring heavily silt-laden water in breeding grounds.

Anopheles stephensi Liston

This species is distributed throughout practically the whole of India except the Andaman Islands. It is most common in western India, the Bombay Presidency, Rajputana, and less so in the east where, although it is extremely common in Calcutta, it has not been recorded from the rural areas of Lower Bengal. It was first definitely proved to be a vector by Bentley (1911) in Bombay, and there are now available the results of the dissection of 7,731 specimens, in 54 of which sporozoites have been found.

Sporozoites have been recorded in the salivary glands in Bombay, the North-West Frontier Province, the United Provinces and Madras.

Specimens with oöcysts only have been found in Mysore, Sind and Delhi. It is probably an important vector under rural conditions in the west of India, and under urban conditions throughout most of peninsular and northern India.

Breeding places.—*A. stephensi* is the characteristic species to be found in domestic and ornamental water in the towns of India. Its preference is for 'fresh water, constantly renewed; it will not breed in foul or stagnant water; it will breed with equal facility in dark places and those exposed to the direct rays of the sun, and in any depth of water'; a description which, made for Bombay by Covell (1928), applies equally well to almost any town in India. As a consequence, the cisterns, wells, masonry tanks and ornamental water of most towns abound with its larvæ. In rural areas of western India it will breed freely in swamps, riverside pools, and even rainwater pools on the ground. One of us has noticed in rainwater pools the marked larvicidal action of silt, the muddy pools in ploughed fields being free from this species, whilst it was abundant in the clean pools of open land. In northern India it is less discriminating in its choice of water, and we have seen its larvæ in profusion in a heavily sewage-laden drain.

Seasonal distribution.—In the coastal towns such as Bombay and Calcutta it appears to have a marked seasonal increase during the monsoon, though it is to be found at all times. In central India this is less marked. Christophers (1911) and Hodgson (1914) have noted that in Delhi it increased during the monsoon but only to a slight extent. In the rural areas of the Punjab it breeds in large numbers during the hot weather from March to June, and disappears almost completely at the onset of the monsoon (Macdonald and Majid, 1931).

Feeding habits.—In the west of India *A. stephensi* is a house-haunting mosquito; we have caught adults in thousands in houses in Kathiawar, and also in the Bombay Presidency. Bentley and Covell found no difficulty in catching them in the tenements of Bombay, and they have been noted in houses in many malaria surveys in that part of India. In Calcutta they are not house-haunting mosquitoes; although they are extremely common in the larval stage, yet they form a minute proportion of the adults recovered from houses. We do not know in which areas throughout India it lives in human habitations and feeds on human blood, but there is obviously a marked difference between its habits in the extreme west and the extreme east.

Discussion.—*A. stephensi* is found in the larval stage in roughly equal numbers in Bombay and Calcutta. In Bombay it frequents houses and in Calcutta it does not. In Bombay, Bentley and Covell have proved without a doubt that it is the chief vector of malaria, and 'in every case where malaria has been found

to be present to any considerable extent, permanent breeding places of *A. stephensi* have been found in the immediate vicinity'. In Calcutta, on the other hand, it does not transmit malaria to any marked extent; although it is pulling in nearly every receptacle for water in Calcutta city yet the amount of endemic malaria in Calcutta at the present time is very slight and it has not been shown that anything more than minor local outbreaks due to this species have occurred.

Covell (1932a) would seem to explain this relative freedom of Calcutta on the assumption that the numbers of *A. stephensi* have only recently increased, and considers that in the future the prevalence of locally-acquired malaria will increase correspondingly. We are unable to accept this explanation because *A. stephensi* has been firmly entrenched in Calcutta for a long enough time to affect the incidence of malaria. A very similar situation was discovered sixteen years ago by Iyengar (1920), yet there appears to have been no increase in malaria due to *A. stephensi* during that time.

A second suggestion made by Knowles and Basu (1934) is that there are two distinct races of *A. stephensi*, androphilous and zoophilous, respectively, of which the latter mainly is found in Calcutta. This is a suggestion that has not been verified, and that patently demands investigation.

A third possibility to explain the difference in the transmission of malaria is that the susceptibility of *A. stephensi* to malaria is restricted by very narrow climatic limitations. Strickland, Roy and Chaudhuri (1933) have worked on this possibility, and have shown that, amongst other factors, a high maximum temperature is inimical to successful infection of *A. stephensi*, and that in consequence it is difficult to produce experimental anopheline infections in Calcutta during the period from March to July.

We prefer not to express an opinion on which of these explanations, if any of them, accounts for the difference between the two towns, but draw attention to an interesting difference and the need for further work on it.

Control.—The control of urban malaria caused by *A. stephensi* is the control of domestic, stored, and ornamental water. The classical report on malaria in Bombay by Covell (1928), which should be in the possession of every medical officer of health, describes the necessary measures in detail. A specially organized and trained staff is needed to carry out and supervise the work, and legislation to enforce it. Wells should be covered with concrete, if necessary with glass and perforated zinc panels to admit light and air to comply with religious requirements, and water drawn by pump. Cisterns should be covered with sheet iron or reinforced concrete, with approved types of

manhole, inlet, and overflow, and should be subjected to periodical inspection. Private ornamental water should be prohibited, and public fountains carefully controlled, preferably by regular drying. Stored water reservoirs should be treated regularly, whether found to contain larvæ or not, with either paris green or oil. There are scores of miscellaneous types of water which need control, such as that used in building construction, to which saponified cresol should be added, gutters which should be properly graded, cellars which should be filled in to above the highest subsoil-water level, discarded tins and earthenware vessels which should be forbidden under penalty.

In the case of rural malaria due to *A. stephensi*, control of this type is not yet feasible. Co-operative effort in western India, similar to that in Bengal, should make possible the prevention of breeding within the village. When it is impossible to remove surface water round the village by drainage we believe that practical use could be made of the observation that *A. stephensi* does not breed in silty water, but are unaware of any case where this has been applied. In our experience *A. stephensi* is not to be found in pools on cultivated or ploughed land, and a redistribution of the areas under cultivation and pasture should often be effective.

THE *Anopheles philippinensis* GROUP

Anopheles philippinensis Ludlow

This species has been collected in Burma, Assam, Bengal, Andaman Islands, Madras Coast and Bombay Deccan. It is a common species in north-eastern India. The first records of sporozoite findings in India are those of Fee-grade (1926) in Burma, and Sur (1928) in Bengal. There have now been dissected a total of 36,194, in 179 of which sporozoites have been found.

The positive findings are from Bengal and Burma, in which two places it is undoubtedly an important vector. It is undoubtedly not an important vector in Assam, where the Ross Institute workers alone have been responsible for 12,464 dissections, all of which were negative.

Breeding places.—Both in Bengal and in Assam this species selects clean cool stagnant water containing aquatic vegetation. Deep tanks for the conservation of drinking water, which never become unduly hot and which usually contain vegetation, are favourite breeding grounds, as are also permanent pools under light shade. It does not breed in the absence of aquatic vegetation, nor in shallow pools fully exposed to the sun, nor in temporary water, running streams or muddy water. The influence of aquatic vegetation has been particularly commented on by Bose (1931) in Bengal, who found that he could attract or repel the species from village drinking water tanks by introducing or removing suitable vegetation.

Seasonal distribution.—Larvæ and adults are to be found throughout the year, but the period of maximum prevalence, both in Bengal and Assam, is the autumn, from August to December.

Feeding habits.—This species has completely different feeding habits in Assam and Bengal. In the former it is zoophilic and in the latter androphilic. In Assam, Ramsay, Chandra and Lamprell (1936) examined the blood meals of 343 specimens by the precipitin method. Of these, 22 contained human blood alone or mixed with ruminant blood, 290 contained ruminant blood alone, while in the remaining 31 it was impossible to determine the source of the meal. The androphilic index was therefore 6.4 per cent, a very low figure.

There are no records of precipitin tests from Bengal but a comparison of the differential house and cowshed counts made in Assam by Manson and Ramsay and in Bengal by Timbres will show how much more commonly it frequents houses in the latter province.

	Assam	Bengal
Number caught in houses ..	215	12,253
Percentage of total house catch ..	7.9	10.07
Number caught in cowsheds ..	247	382
Percentage of total cowshed catch ..	15.7	1.17
Ratio of percentage house to percentage cowshed catch	1/2	8.6/1

Discussion.—A great difference in the pathogenicity of this species in the two provinces of Assam and Bengal has been fully demonstrated, and there is reason to believe that its feeding habits show corresponding differences. We have already discussed, in the case of *A. stephensi*, the possible causes of differences in pathogenicity, which apply equally to this species. It is a subject requiring much further research.

Control.—In the majority of Bengal villages the drinking-water tank and dead river loops are the chief sources of this species of anopheline. The removal of vegetation, as suggested by Bose, is a very efficient form of control, whose efficacy lasts for several years if radically carried out. The only objection to periodical cleaning is the cost, and we suggest that experiments should be carried out to determine the most economical methods of eradication. The possible methods are manual removal after drying of the tank; periodical dragging with chains to break the stems; and some form of chemical destruction, such as by oil, or the destruction of algæ by copper sulphate, at increasing intervals. Should the latter method be used a temporary closure of the tank would be required, but this should be easy in a village with an active malaria committee and many tanks. The value of the vegetation as compost is not to be ignored if mechanical removal should be chosen.

Another useful and practical measure is the destruction of vegetation at the edges by shade, such as by the bamboo matting mentioned in

the case of *A. minimus*, associated with the encouragement of fish, which have a considerable commercial value. Disused tanks should be filled, or, where it is possible, drained.

In rural Bengal energetic action on such lines as these has already been taken by co-operative anti-malaria societies, and excellent results have been achieved. It is to be hoped that this type of co-operative action will not only thrive in Bengal, but will spread to other parts of India, because in it lies our only real hope of the reduction of rural malaria.

Anopheles annularis Van der Wulp

Anopheles annularis is widespread throughout India, 57,840 have been dissected, and sporozoites found in 31, the first positive dissection being by Adie (1903). Sporozoite rates have never been high, no record of any considerable number exceeding 1 per cent, and the vast majority being far below this figure. There have also been many lengthy series of entirely negative dissections, and no epidemiological evidence has been produced to incriminate it as primarily responsible for an outbreak of malaria.

The area in which the majority of the infected specimens have been discovered is Bengal, and Timbres has there made a careful study of it. He considered that, in the Birbhum district, *A. philippinensis* was the principal carrier species, and that *A. annularis* and *A. pallidus* fulfilled a subsidiary rôle. He found a sporozoite rate of 0.02 per cent in *A. annularis*, and 1.04 per cent in *A. philippinensis*; the ratio of these percentages did not quite represent the relative importance of these two species, as *A. annularis* was the more numerous of the two. He concluded that this species was about one-seventh as important as *A. philippinensis*.

In Bengal the larvæ are to be found in precisely those waters favoured by *A. philippinensis*, a fact which makes special control measures unnecessary. We have also noted in the Punjab that its likings are very similar to those of *A. culicifacies* except that it is more likely to restrict itself absolutely to typical waters.

The seasonal distribution is perennial, with a decrease during the extreme heat of April, May and June. About equal numbers are to be found in houses and cowsheds, but Ramsay, Chandra and Lamprell found by serological tests that in only 1.6 per cent of those with recognizable blood meal was the human blood.

Anopheles pallidus Theobald

Anopheles pallidus, which has a wide distribution throughout India, is included in this series on the strength of 12 infections with sporozoites found in 29,678 dissections. All of these positive records, which were made by Sur and Sur (1929) and Timbres, come from Bengal, where the great majority of the total dissections have been made.

The chief evidence is that of Timbres who found 0.03 per cent of 27,238 dissected, infected. *A. philippinensis* was the important local vector but he considered that *A. pallidus* was responsible for the spring malaria, as all the sporozoite findings were during the preceding cold weather, at a time when no infected *A. philippinensis* were to be found.

The breeding places of this species were also identical with those of the chief carrier, but its seasonal prevalence was somewhat different, its chief prevalence being during the cold months from October to February. Adults were slightly, but not markedly, more common in houses than in cowsheds. Control measures effective for *A. philippinensis* are also effective for this species.

Other species

The bionomics of nine species have been described in some detail because there is sound

reason to believe that each of them may be, under some circumstances, an important vector of malaria in India. Sporozoites have been found in three other species. *A. ramsayi* has once been found infected in 2,217 dissections, and is believed on epidemiological grounds to be quite harmless. *A. maculatus* and its variety *willmori* have been found infected in Assam but epidemiological evidence, and a very large number of negative dissections at a time when other species were found infected, make its importance quite problematical. *A. vagus* has once been found to harbour sporozoites, out of a total of roughly 35,000 of whose dissections we have a record, and is quite unimportant as a vector. We do not consider it necessary to describe the bionomics of any of these species in detail.

Discussion

We have attempted to outline briefly our knowledge of the infectivity of the Indian *Anophelini*, and the bionomics of the known vectors. Although the number of dissections now available is imposing, it is still quite inadequate. There are very extensive areas of India in which no infectivity survey has ever been made, and it is only in Assam, Bengal, Madras, the Punjab, Mysore, Sind and Bombay town that our knowledge could be called at all adequate. In other areas there are either inadequate numbers of dissections, or in many none at all. It is essential that our knowledge should be widened, and that infectivity surveys should be carried out in every part of India.

The bionomics of the *Anopheles minimus* group have been so fully studied that it is possible to give a detailed description of its breeding and feeding habits. It is possible for the malariologist to recognize the waters in which it will choose to breed and those in which it will not, and usually possible for him to suggest alterations in the physical character of a breeding place which will make it unsuitable without great expense. In the case of the other vectors our knowledge is not so full. We have some knowledge of the breeding places of each species, but in most cases insufficiently detailed to make true biological control possible. Our knowledge of the feeding habits of anophelines is quite rudimentary. In this paper we have, for the most part, made use of a comparison of the numbers to be found in houses and cowsheds, but this is a misleading and very rough guide. For instance the figures given for *A. philippinensis* in Assam showed that this species was twice as common in cowsheds as in houses; examination of the blood meal by the precipitin test showed that it in fact imbibed ruminant blood thirteen times as often as it did human blood.

The use of the precipitin test has produced unexpected results and proved to be of unexpected value. The transmission of malaria requires

at least two human blood meals, separated by a suitable interval; a zoophilic species rarely imbibes human blood and becomes infected with malaria; moreover only a small proportion of those becoming infected will bite man again to transmit the infection. It is possible to express the potential danger of species mathematically according to their androphilic indices; from this we will spare our readers; suffice it to say that the necessity for two blood meals greatly increases the importance of the androphilic index.

There is reason to believe that other detailed investigations of the breeding, feeding and sheltering habits of anophelines will produce equally valuable results; the recent decision of the Royal Society to support this type of work in India should introduce a great advance in the science of malariology.

There is, also, a need for further systematic work, alone and combined with this type of biological enquiry. The division of an existing species into two species or varieties immediately confuses the meaning of all the work which has been done on that species in the past, and it is better that such differentiation should be done early rather than late. Detailed systematic examination of specimens, and comparison with description of type specimens, should be the precursor of all surveys of infectivity or bionomics. It is not until we are certain of the homogeneity and distribution of every species and variety that experimental results in one area can be applied to another.

There are already certain problems calling urgently for systematic and biological enquiry. We have drawn attention to the variations in infectivity of *A. philippinensis* in Assam and Bengal, and of *A. stephensi* in Calcutta and Bombay. It has been shown in Europe that like differences in the behaviour of *A. maculipennis* are associated with morphological and biological differences sufficient for the subdivision of the species into a number of races. Other possible controlling factors are the prevalence of alternative sources of blood, climatic factors which may in some places inhibit the sexual cycle of the parasite in the insect host, the habits and housing conditions of the people, or differences in the seasonal occurrences of a species attributable to the different types of breeding places available.

Summary

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the case of *A. minimus*, associated with the encouragement of fish, which have a considerable commercial value. Disused tanks should be filled, or, where it is possible, drained.

In rural Bengal energetic action on such lines as these has already been taken by co-operative anti-malaria societies, and excellent results have been achieved. It is to be hoped that this type of co-operative action will not only thrive in Bengal, but will spread to other parts of India, because in it lies our only real hope of the reduction of rural malaria.

Anopheles annularis Van der Wulp

Anopheles annularis is widespread throughout India, 57,840 have been dissected, and sporozoites found in 31, the first positive dissection being by Adie (1903). Sporozoite rates have never been high, no record of any considerable number exceeding 1 per cent, and the vast majority being far below this figure. There have also been many lengthy series of entirely negative dissections, and no epidemiological evidence has been produced to incriminate it as primarily responsible for an outbreak of malaria.

The area in which the majority of the infected specimens have been discovered is Bengal, and Timbres has there made a careful study of it. He considered that, in the Birbhum district, *A. philippinensis* was the principal carrier species, and that *A. annularis* and *A. pallidus* fulfilled a subsidiary rôle. He found a sporozoite rate of 0.02 per cent in *A. annularis*, and 1.04 per cent in *A. philippinensis*; the ratio of these percentages did not quite represent the relative importance of these two species, as *A. annularis* was the more numerous of the two. He concluded that this species was about one-seventh as important as *A. philippinensis*.

In Bengal the larvæ are to be found in precisely those waters favoured by *A. philippinensis*, a fact which makes special control measures unnecessary. We have also noted in the Punjab that its likings are very similar to those of *A. culicifacies* except that it is more likely to restrict itself absolutely to typical waters.

The seasonal distribution is perennial, with a decrease during the extreme heat of April, May and June. About equal numbers are to be found in houses and cowsheds, but Ramsay, Chandra and Lamprell found by serological tests that in only 1.6 per cent of those with recognizable blood meal was the human blood.

Anopheles pallidus Theobald

Anopheles pallidus, which has a wide distribution throughout India, is included in this series on the strength of 12 infections with sporozoites found in 29,678 dissections. All of these positive records, which were made by Sur and Sur (1929) and Timbres, come from Bengal, where the great majority of the total dissections have been made.

The chief evidence is that of Timbres who found 0.03 per cent of 27,238 dissected, infected. *A. philippinensis* was the important local vector but he considered that *A. pallidus* was responsible for the spring malaria, as all the sporozoite findings were during the preceding cold weather, at a time when no infected *A. philippinensis* were to be found.

The breeding places of this species were also identical with those of the chief carrier, but its seasonal prevalence was somewhat different, its chief prevalence being during the cold months from October to February. Adults were slightly, but not markedly, more common in houses than in cowsheds. Control measures effective for *A. philippinensis* are also effective for this species.

Other species

The bionomics of nine species have been described in some detail because there is sound

reason to believe that each of them may be, under some circumstances, an important vector of malaria in India. Sporozoites have been found in three other species. *A. ramsayi* has once been found infected in 2,217 dissections, and is believed on epidemiological grounds to be quite harmless. *A. maculatus* and its variety *willmori* have been found infected in Assam but epidemiological evidence, and a very large number of negative dissections at a time when other species were found infected, make its importance quite problematical. *A. vagus* has once been found to harbour sporozoites, out of a total of roughly 35,000 of whose dissections we have a record, and is quite unimportant as a vector. We do not consider it necessary to describe the bionomics of any of these species in detail.

Discussion

We have attempted to outline briefly our knowledge of the infectivity of the Indian *Anophelini*, and the bionomics of the known vectors. Although the number of dissections now available is imposing, it is still quite inadequate. There are very extensive areas of India in which no infectivity survey has ever been made, and it is only in Assam, Bengal, Madras, the Punjab, Mysore, Sind and Bombay town that our knowledge could be called at all adequate. In other areas there are either inadequate numbers of dissections, or in many none at all. It is essential that our knowledge should be widened, and that infectivity surveys should be carried out in every part of India.

The bionomics of the *Anopheles minimus* group have been so fully studied that it is possible to give a detailed description of its breeding and feeding habits. It is possible for the malariologist to recognize the waters in which it will choose to breed and those in which it will not, and usually possible for him to suggest alterations in the physical character of a breeding place which will make it unsuitable without great expense. In the case of the other vectors our knowledge is not so full. We have some knowledge of the breeding places of each species, but in most cases insufficiently detailed to make true biological control possible. Our knowledge of the feeding habits of anophelines is quite rudimentary. In this paper we have, for the most part, made use of a comparison of the numbers to be found in houses and cowsheds, but this is a misleading and very rough guide. For instance the figures given for *A. philippinensis* in Assam showed that this species was twice as common in cowsheds as in houses; examination of the blood meal by the precipitin test showed that it in fact imbibed ruminant blood thirteen times as often as it did human blood.

The use of the precipitin test has produced unexpected results and proved to be of unexpected value. The transmission of malaria requires

at least two human blood meals, separated by a suitable interval; a zoophilic species rarely imbibes human blood and becomes infected with malaria; moreover only a small proportion of those becoming infected will bite man again to transmit the infection. It is possible to express the potential danger of species mathematically according to their androphilic indices; from this we will spare our readers; suffice it to say that the necessity for two blood meals greatly increases the importance of the androphilic index.

There is reason to believe that other detailed investigations of the breeding, feeding and sheltering habits of anophelines will produce equally valuable results; the recent decision of the Royal Society to support this type of work in India should introduce a great advance in the science of malariology.

There is, also, a need for further systematic work, alone and combined with this type of biological enquiry. The division of an existing species into two species or varieties immediately confuses the meaning of all the work which has been done on that species in the past, and it is better that such differentiation should be done early rather than late. Detailed systematic examination of specimens, and comparison with description of type specimens, should be the precursor of all surveys of infectivity or bionomics. It is not until we are certain of the homogeneity and distribution of every species and variety that experimental results in one area can be applied to another.

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ON THE MODE OF ACTION OF ATEBRIN ON *PLASMODIUM KNOWLESI*—A PRELIMINARY NOTE

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THE question as to whether atebtrin acts directly on the parasites or exerts its action in an indirect manner, as suggested by several workers in the case of quinine, has not been definitely settled. Kirschbaum (1923) observed that after mixing *in vitro* quinine solution of a strength of 1 : 5,000 with an equal quantity of blood in which *Plasmodium vivax* were present and keeping the mixture for 5 to 24 hours at a temperature of 37 to 39°C., it was capable of infecting paralytics. This concentration of quinine, i.e., 1 in 10,000, is far greater than what is actually obtained in the circulating blood. This experiment demonstrates fairly well that quinine has no direct action upon the parasites. This conclusion is also borne out by other experiments; for example, Ramsden, Lipkin and Whitley (1918) reported that, in certain cases, they found the quinine content to be the highest and symptoms of cinchonism greatest in those in whom the parasites persisted the longest. Chopra and Das Gupta (1934) in their studies on the action of quinine and atebtrin on *P. knowlesi* have shown that atebtrin has a much more powerful immediate effect on the parasites than has quinine. Even when the parasite count in the peripheral blood is high, viz., about half a million per c.mm. of blood, one dose of atebtrin brings down the number and controls the infection. In the case of quinine one dose, intramuscular or intravenous, is only effective when the parasite count is low, i.e., below 100,000 per c.mm. The difference, however, in the ultimate effects of the two drugs on the infection is remarkable, so far as the reappearance of the parasites in the blood and the virulence of the relapse is concerned; whereas after 5 days' intensive treatment with atebtrin in large doses, the parasites invariably reappeared in 10 to 15 days and multiplied with the same rapidity as in the primary attack causing death of the animal if prompt treatment were not given, in the case of quinine often the parasites did not reappear in the blood and, if they did appear, they were scanty in number, did not multiply and did not produce death of the animal. In this relapse the parasites often disappeared spontaneously without treatment, or a very low grade of infection persisted as was the case in the atebtrin series, only after the treatment of the relapses with atebtrin.

This experiment gives us a fairly good insight into the mode of action of these two drugs. In

the case of atebirin, the infection is rapidly controlled which shows that this drug has probably a more or less direct action on the parasites; whereas in the case of quinine it takes a longer time to bring the infection under control. The nature of the relapses after treatment with these drugs also points to a similar conclusion. When relapses take place after treatment with quinine, the parasites are few in number, do not multiply and often disappear spontaneously; whereas in the case of atebirin though the infection is rapidly controlled relapses invariably take place in 10 to 15 days and the parasites multiply with very great rapidity killing the animals if prompt treatment is not resorted to. This difference in the nature of relapses may be accounted for on the basis of the mode of action of these drugs. The rapidity of the action of atebirin points more or less to its direct action on the parasites and the relapses are probably due to the fact that a small number of parasites lurk in areas which are either inaccessible to the drug or where the concentration of atebirin is exceedingly small. After 10 to 15 days, when the concentration of atebirin in the system is considerably depleted the parasites return to the circulation and multiply. On the other hand in the case of quinine the action is much slower but it exerts a more prolonged action probably by indirectly stimulating the reticulo-endothelial system. When relapses take place after the administration of quinine, the parasites have already lost their vitality and a few parasites that still survive have not the capacity for multiplication and die spontaneously. The experiments of Kirschbaum (1923) and that of Ramsden, Lipkin and Whitley (1918), already referred to, also point to the same conclusion.

Chopra, Ganguly and Roy (1935) have shown that there is no direct relationship between the concentration of quinine in the blood and the parasite count at any particular time. The highest concentration of the alkaloid attainable without producing too severe toxic effects produces no apparent reduction in the number of parasites nor degenerative changes in them. On the other hand in the majority of cases there was a definite apparent increase in the number of parasites per c.mm. of blood after administration of quinine. They were of the opinion that the action of quinine on parasites was not direct but probably synergistic to other mechanisms set up in the body. Again the experiments of Chopra, Ganguly and Roy (1936) on the relationship between the concentration of atebirin in the circulating blood and parasite count also suggest that atebirin unlike quinine may have a direct lethal action on *P. knowlesi*.

Peter (1935) in comparing the mode of action of quinine and atebirin has observed that the action of atebirin on malaria parasites is in all probability a direct one. Atebrin has a marked

affinity for the parasites to which it becomes firmly bound.

With a view to gaining an insight into the mode of action of atebirin by direct experiments we followed the procedure adopted by Kirschbaum in the case of quinine. For our experiments we used *Silenus rhesus* monkeys, as these animals are readily susceptible to infection with *P. knowlesi*.

Experimental

A solution of atebirin was made in sterile physiological salt solution in a strength of 1 in 25,000. Blood of a monkey showing a heavy infection (680,000 per c.mm. of blood) was obtained, defibrinated in a flask containing small beads, mixed with equal volume of atebirin solution or normal saline, incubated for 24 hours at 22°C. or 37°C., and inoculated subcutaneously into four monkeys as shown in the table below :—

TABLE

	Weight of monkey in kilo	INOCULATED WITH 0.5 C.C.M. INFECTED BLOOD	
		Mixed with	and incubated at
1	4.50	0.5 c.cm. atebirin solution.	37°C.
2	3.62	0.5 c.cm. atebirin solution.	22°C.
3	3.75	0.5 c.cm. normal saline.	37°C.
4	4.20	0.5 c.cm. normal saline.	22°C.

Result

Monkey no. 3 died 3 days after inoculation; autopsy showed consolidation of both lungs.

Monkey no. 4 showed parasites on the 8th day of inoculation (a few rings and schizonts); on the 9th day, 16 per cent of the red cells were infected; on the 10th day, 65 per cent. Treatment was now started; 13 days after the usual 5-day course of treatment, the parasites reappeared, multiplied vigorously and killed the animal.

The blood of monkeys no. 1 and no. 2 were examined every alternate day from the 7th day of inoculation for a period of 35 days, but no parasites were ever detected. In order to exclude the possibility of the presence in these animals of a scanty infection, which might have been missed by the examination of blood smears, the bloods of these two monkeys were both cultured and sub-inoculated into two fresh monkeys on the 37th day. The cultures were negative and the inoculated animals have so far shown no evidence of infection. These monkeys are still under observation.

(Continued at foot of next page)

HEAT EXHAUSTION AND DEHYDRATION IN THE ARABIAN DESERT

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THE forced landing of the airship 'Horsa' in the Arabian Desert at 4 a.m. on Saturday, 29th August, presented an occasion—unwelcome though it was—to observe the effects of the heat exhaustion followed by great body desiccation after a few hours' exposure to dry desert heat. A few notes may be of some general professional interest.

On the atmospheric conditions.—One officer was interested in this point and watched the available thermometers. In the shade of the wings where the passengers lay he estimated that the air temperature was about 125° or 130° from soon after sunrise to sunset. This, of course, was a temperature much above that of the human body. The air humidity was extremely low, since the air was scorched-dry in its passage over the burning desert sands, which surrounded the airship on all sides and continued without water, trees' shade or vegetation for some 50 miles.

(Continued from previous page)

Conclusion

The experiment shows that atabrin solution in a dilution of 1 in 50,000 is capable of destroying the parasites even when the infection is heavy. The smears of blood which were kept in contact with atabrin showed degenerative changes in the parasites, whereas animals inoculated with the infected blood only behaved in the usual way.

From the above one may reasonably conclude that atabrin has more or less a direct action on the parasite. Further work is in progress with weaker solutions of atabrin in order to determine the limits of concentration up to which it is effective in its lethal action on parasites.

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Air movement.—A continuous fair breeze—though hot and dry—made conditions seem less unpleasant.

On the resulting heat exhaustion

The first experience of great body heat stimulated endeavours to anticipate and to minimize the condition which was likely to follow; the symptoms were slight restlessness, considerable giddiness and faintness, inability to walk beyond a few steps or even to stand, and rapid shallow breathing. Such symptoms were followed by signs of severe cardiac collapse, evidenced by a cold skin, a feeble pulse and cyanosis. The clammy sweat one would have expected with cardiac collapse was not apparent since it at once evaporated and increased the skin coldness. The available brandy, spiritus ætheris nitrosi, digitalis, and eau de Cologne for such cases proved invaluable. The early appearance of such cardiac collapse symptoms amongst a group of fit officers returning from leave was remarkable. The ship's captain and navigation officer were the first two cases. They developed symptoms about noon after some six hours' exposure which included the early morning hours when the heat was less trying.

On the influence of mental strain

In them, however, the considerable mental strain, to which they had been exposed for two hours before landing, provided a special predisposing factor. During this period the Bahrein aerodrome could not be located on account of defective lighting and the enveloping haze, whilst wrong air bearings directed the airplane further into the desert instead of into its air port. Petrol was almost exhausted but a forced landing in unknown country before the first light of the breaking dawn was full of the gravest danger. In such circumstances the responsibility for passengers, mail and plane was no light one.

On the influence of physical exertion

The least movement added to the body heat which the vital processes themselves produced. We soon found that exertion of any degree was followed by increasing weakness and that a few yards of staggering walk was of necessity followed by a period of breathless immobility. All, therefore, soon diminished physical exertion to an absolute minimum. And yet it was remarkable how 11 out of the 13 managed to cross one mile of desert at 2 in the afternoon to the rescuing R. A. F. bomber—though it was true that this was accomplished after copious fluid and concentrated foods.

It appeared indeed doubtful whether all could cross that mile but the attainment of safety at the end was the prize that won through. Some marched with eyes fixed on the ground a few yards ahead. To look at the plane itself seemed a distance impossible of attainment. I personally made for a selected mark about 20 yards

ahead and, encouraged by the successful accomplishment of that, chose successive such landmarks till the plane was reached. Perhaps I was lucky in being the possessor of an umbrella, which was especially fortunate, as two of us had no topees. Some of us at bad periods were helped by gallant men of the Royal Air Force. Three-quarters of an hour were spent on that mile in absolute silence, every energy being concentrated on the goal to be attained.

Resulting body dehydration

The dry scorching breeze like a blast from a furnace sucked fluid through the skin sweat glands which immediately evaporated so that no visible sweat was produced. This evaporation, no doubt, caused some slight cooling of the skin surface, which made us choose to lie where the breeze was. But such temporary cooling was produced only at the vital expense of the invisible constant drain of body fluids through the skin to the atmosphere. I recall considering whether it would be of greater advantage to lie where there was no breeze and conserve one's body fluids, or to hazard the future for the slight relief the breeze gave. And the present won! The available fluids, in the ration of three-quarters of a small tea-cup thrice daily, were a drop in the ocean in an attempt to replace any material part of the fluid lost through the skin. The clinical result was not unlike that of a cholera attack though the fluid was not lost through the same channel. The skin became 'bone' dry and lost elasticity. The eyes sank into their sockets and became encased with heavy dark rims. The cheeks hollowed, the pulse became feeble—and its tension fell due to diminished volume from dehydration. The urinary secretion failed, so that a few ounces only were voided in the 24 hours and that of the deepest colour, most concentrated and highly acid—so that its passage was accompanied with a slight sting. Blood changes, resulting from the rapid loss of blood fluid, must have corresponded to those in cholera. The total red and white cells must have relatively risen—and blood become thick and 'tarry'. Cyanosis certainly developed. The highly acid urine pointed to a reduced blood alkalinity, as in cholera. The blood urea must have considerably risen. The urea retention was not due to failure of the excretory kidney function from organic disease, as in the uræmia of advanced Bright's disease, but to retention due to desiccation of the body—by an acute drain of the body fluids from it—with insufficient fluids by the mouth to provide for a urinary secretion—as in cholera and at times in diabetic coma. It will be recalled that an easy method of bedside differentiation of these two types of retention is by estimating the concentration of urinary urea, which is high in dehydration when the kidney is healthy and could concentrate well, and low in Bright's

uræmia when the kidney is almost entirely destroyed. No doubt toxic metabolic products and acids retained by the failure of the urinary excitation were in great part responsible for the muscular weakness producing physical inactivity, for the mental drowsiness which all felt, for the dyspnoea from which many suffered, and for minor bouts of Cheyne-Stokes' respiration which also occurred.

On mental reactions

During the first few hours the faculties of perception and understanding were stimulated. The situation seemed appreciated in its correct perspective with the utmost clarity and right decisions seemed easily and rapidly reached. Later such periods of clarity were recalled whenever decision or thought was required, but periods of drowsy sleepiness started to intervene. Amongst the problems to be decided were: the immediate necessity of rationing our slender drink and food resources, of working the plane's ground wireless, of not leaving the plane in any attempt to reach the sea or to search for help, of conserving our strength, of diminishing heat production by body inactivity, of the best time to fire the available 12 Verey lights and 2 magnesium flares which were carried, of other means of possibly attracting attention, of the best manner of aiding our comrades when attacks of exhaustion seized them, of the best employment of the available sedative, sleeping, stimulant and other drugs, of the collection of night dew from the aeroplane wing and of its possible poisoning qualities from aeroplane wing dope if drunk, of sanitary arrangements, and of the manner of dealing with possibly unfriendly Arabs if such appeared.

My present estimate was 5 per cent of chances we should be found on the first day, 95 per cent on the second, and 100 per cent on the third day, but I also estimated (though did not mention) that probably two or three would be dead by the second evening and only two or three would survive by the third evening. Deaths would, I think, have been easy by increasing drowsiness, breathlessness, and cardiac failure.

A few delusions of mild degree arose, e.g., that it was raining beyond the plane, and the individual (who was too weak to move) was being restrained from reaching the cooling water. Some dozed and dreamt. One dream was of turtles waddling in their dozens from a river, fattened by feeding on corpses, and advancing over the desert hungry for their latest victims. Their huge red eyes gleaming in anticipation formed a target for the thrust of the point of the dreamer's umbrella—when thus blinded they attacked each other. Rather too realistic a dream in such circumstances!

The first sounds and sight of the R. A. F. relief planes were too good to be accepted. One heard and refused to believe. One saw and

looked again and yet again lest our senses deceived us. The realization of being saved produced deep emotion even to tears. This was followed in some cases by a fear that we had not been seen, or could not be reached or would again be lost. And again, when we were saved and drinking freely in an R. A. F. bomber, flying back to Bahrein, advice was offered that we should drink no more but save our water, in case the bomber became stranded and we again became waterless. I myself in my host's house at Bahrein was about to pour water from a large jug into a basin to wash my hands—when suddenly my raised hand stopped. I could not pour out this fluid, each drop of which was so precious, in such quantity and for so wanton a purpose! And it took a real effort to pour out that water. We owed our thirteen lives to the R. A. F. flight that found us, and to all those of the R. A. F. or of the Imperial Airways, or of the Royal Navy, who stimulated and helped in so rapid a search. To them our gratitude is in proportion to our debt. Had it not been so rapid, it would have been too late.

On hyperpyrexial heatstroke

Though no cases of heat fever fortunately arose amongst the passengers or crew of the 'Horsa' yet ætiological factors link this condition so closely to heat exhaustion, and the recognition of the factors contributory to hyperpyrexial heatstroke in Indians is so important and their distinctive treatment, if life is to be saved, is so vital that brief reference to hyperpyrexial heatstroke in this contribution seems justified.

My original work on this subject was founded on cases from Mesopotamia—and was published in 1915—under the title of 'Malarial and other infections as ætiological factors in hyperpyrexial heatstroke'. The main conclusions were:—

(i) In 1915, though the Indian Forces in Mesopotamia outnumbered the British Forces by some 4 to 1, yet 96 per cent of the cases for heatstroke (including effects of heat) came from British troops.

(ii) Amongst Indians, hyperpyrexial heatstroke is rare, and pure, that is, uncomplicated hyperpyrexial heatstroke, due solely to heat, is excessively rare. Indeed it should be assumed that if an Indian even under atmospheric conditions predisposing to heatstroke develops hyperpyrexia then there is some underlying unrecognized infection which demands diagnosis and treatment.

(iii) In considerably over 50 per cent of cases amongst Indians the causative infection is malaria. It is, therefore, wise to treat all hyperpyrexial heatstroke in Indians as cerebral malaria—until the contrary is proved, especially is this so when such cases develop in a malarious region, or show an enlarged hard spleen, or give

(Continued at foot of next column)

FOUR CASES OF DUST-SENSITIVE ASTHMA

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and

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COOKE (1922) first drew attention to house dust as an ætiological factor of asthma. Since then there have been reports of many cases of asthma which were dependent on sensitivity to house dust and occupation dusts, such as wheat dust (miller's asthma) and wood dust (e.g., teak). In the case of occupational dusts the nature of the allergen is known, but nothing definite is so far known regarding the active principles in the house dust. In some instances the activity of house dust would appear to depend on the presence in the dust of common allergens to which the patient is sensitive; for example, van Leenwen is of opinion that house-dust allergen is probably a mould, yeast, or some other such substance, but Cooke concluded that in many of his cases the reaction to the house dust did not depend upon minute quantities of common allergens of this nature and that the house-dust allergen was a specific substance. Cohen, Nelson and Reinartz (1935) have produced evidence to the effect that the specific substance responsible for reaction in house dust is not necessarily a mould present in the dust sample; they tested five patients who reacted to dust alone with dust collected from various sources in their homes. Moulds from the dusts giving positive reactions were isolated in pure culture and it was found that the same patients when tested with the mould extracts gave negative results.

We will describe here four cases of dust-sensitive asthma in which the symptoms were ameliorated by means of hyposensitization with the dust extract.

Case 1.—An Indian male, aged 43 years, an oil-mill owner, had been suffering from asthma for five years. The most interesting point in the history was that he got the attacks only when he stayed in Calcutta, but kept quite free at his village residence. Winter made his symptoms worse while he was in Calcutta but had no effect when he was staying at his village residence. Before the asthma started, he had had a bad attack of urticaria and had occasionally suffered from dysentery and from colds and coughs. There was no history of inherited sensitivity.

Nothing abnormal was found on physical examination.

(Continued from previous column)

a history of recent attacks of malarial infection.

(iv) Amongst Europeans, the possibility of two other common causes should be considered: (a) Exposure to the sun from inexperience and from non-acclimatization, and (b) intemperance.

Acute conditions due to great heat give rise to medical emergencies which demand clear thinking and immediate adequate attention if life is to be saved.

Laboratory findings. Blood.—There was a total white cell count of 8,000 per c.mm. with an eosinophilia of 25 per cent. There was not much leftward shift in the Arneeth count, the Arneeth index being 71. The sputum contained some pus cells but no eosinophils. No acid-fast bacilli were found in the smear and pneumococci, staphylococci, and Gram-negative bacilli were isolated on culture. The stools contained no ova, protozoa, nor any pathogenic bacteria. The dermal tests with the foods and epidermal extracts (Parke, Davis and Co.) and the intradermal test with stock house-dust extract gave the following results:—

Control —ive

Cattle hair	.. +	Potato	.. —
Cat hair	.. —	Fowl	.. —
Duck feathers	.. ++	Rice	.. ±
Horse hair	.. —	Mutton	.. ±
Bacteria group 21	.. —	Wheat	.. —
Bacteria group 22	.. —	Egg	.. —
House dust (stock)	.. —		
(intradermal)	.. —	Milk	.. —

On enquiry it was found that he kept cows and ducks at his Calcutta residence but only cows at his village residence. The dermal tests had shown that he was sensitive to both cattle hair and duck feathers, but his asthma could only be associated with ducks, as he did not get the attacks in his village residence in spite of the presence of cows there. It was assumed that his attacks were due to duck-feather sensitiveness. Accordingly he was told to remove the ducks from his Calcutta residence, in addition an autovaccine was prepared from his sputum, and thyroid and suprarenal were given by mouth. This line of treatment yielded no results; after a course of six doses of autovaccine he reported that his condition was unchanged, and that he was getting the usual attacks when he was in Calcutta. This led us to the conclusion that the duck-feather sensitiveness was either not the cause, or at least not the only cause of his asthma.

As in Calcutta he dealt with oils and oil seeds, our suspicion next fell on these substances. We obtained samples of these and employed them for performing dermal tests on him. He dealt with four varieties of seeds and the oils therefrom, and all these were used with negative results.

Control —ive

Rai seed	.. —	Rai seed oil	.. —
Yellow seed	.. —	Yellow seed oil	.. —
Black seed	.. —	Black seed oil	.. —
Reddish seed	.. —	Reddish seed oil	.. —

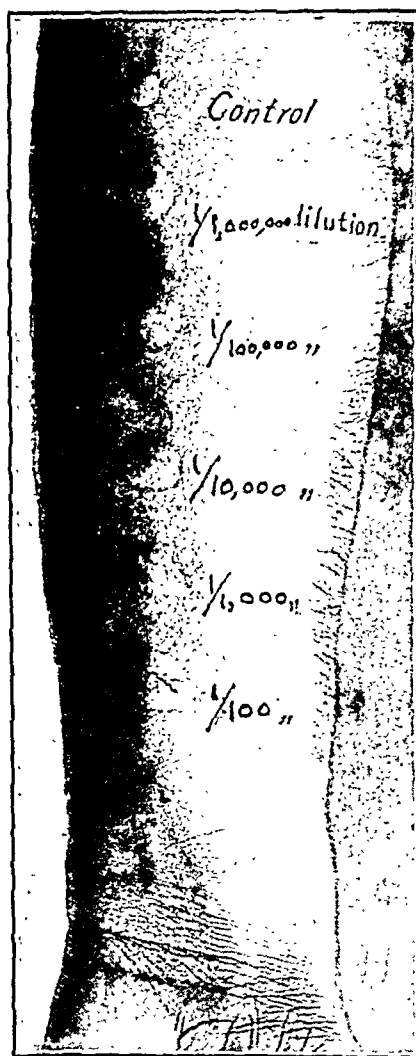
On the oil seeds and the oils giving negative results, it was decided to visit his Calcutta house and oil mill to see the local conditions. In the house nothing of importance was found. In the mill it was observed that his office room was next to the room in which the seeds were cleaned and sifted before being crushed, and there was much dust in that room. It was thought that this seed dust might be the offending substance. This belief was strengthened by the statement volunteered by the patient that his worst attacks had always come when the dealers brought the samples of seeds and, in order to show that their seeds contained very little dust, displayed the seeds in front of him in such a way that most of such dust as there was was directed towards him. A small quantity of the seed dust from the mill was brought to the laboratory and a 1 per cent extract was prepared in Coca's fluid. The intradermal tests with the different dilutions of this extract (0.02 c.cm.) gave the following results (*vide illustration*):—

Control	.. +
1/1,000,000 dilution	.. +++
1/100,000 "	.. +++
1/10,000 "	.. +++
1/1,000 "	.. +++
1/100 "	.. +++

The results were specially interesting as the patient did not react to intradermal tests with stock dust

extract and dermal tests with the different oils and oil seeds. The patient was told to avoid the seed dust as much as possible and at the same time hyposensitization with dust extract was commenced. Twenty injections were given, the first dose being 0.1 c.cm. of 1/1,000,000 dilution; this was increased gradually to 1 c.cm. of 1/1,000 dilution. At first the injections were given twice a week and later once a week.

Nothing was heard from the patient until about three years after the treatment when he came into hospital suffering from epidemic dropsy. On enquiry it was found that he had been free from the attacks for about a year, at the end of which period the attacks gradually returned but were never as bad as before.



Summary of special points in the case

(1) The patient suffered only when in Calcutta and remained free from the attacks at his village residence. Evidently there was something in his surroundings at Calcutta that was acting as an exciting agent.

(2) Sensitiveness to a substance as demonstrated by a positive dermal test was present but was not the cause of the symptoms. He was sensitive to cattle hair but this sensitiveness could not possibly be the cause of his asthma, as he remained free from attacks at his village residence in spite of the presence of cattle there. Probably the same might be said of his sensitiveness to duck feathers.

(3) Dermal tests with different seeds and oil seeds, and the intradermal test with the stock dust extract were negative.

(4) Intradermal tests with the seed-dust extract gave positive results in high dilutions.

(5) Hyposensitization with the seed-dust extract kept the patient free from attacks for about a year.

Case 2.—A European male, aged 30 years. Duration of asthma two months. The asthmatic attacks started after he had moved to a particular locality. The attacks were relieved by an injection of adrenalin, but the injection gave rise to pain, which started at the site of injection and gradually spread to the whole of the body.

His tonsils had been removed five years previously and he had an attack of pneumonia and pleurisy four years ago.

Physical examination.—There were wheezing rhonchi on both sides and the expiration was prolonged.

Laboratory findings.—Total white-blood-cell count of 16,000 per c.mm. with an eosinophilia of 17 per cent. *Entamoeba histolytica* cysts were present in the stools. His von Pirquet test was positive. A skiagram of the chest was suggestive of chronic bronchitis, but there was no lung infiltration. There was no response to a hypodermic injection of gr. 1/20 pilocarpine nitrate. Free and total gastric acidity were on the high side of the normal range. Intradermal tests with the extract of the dust collected from his room showed that he was sensitive to it in a dilution of 1/1,000,000.

Intradermal tests with the extract in ten other asthmatics gave the following results:—in four cases doubtful reaction, even in 1/100 dilution; in two cases small but definite reaction in 1/100 and 1/1,000 dilutions; and in four cases small but definite reactions in 1/1,000,000 dilution.

Hyposensitization with the dust extract was started; 15 injections were given and the patient kept well for three months; nothing was heard from him after that period. The initial dose was 0.1 c.cm. of 1/100,000 dilution. It was gradually increased to 0.5 c.c. of 1/100 dilution.

Summary of special points in the case

(1) The attacks started after moving to particular premises.

(2) Extract of the dust collected from these premises gave positive dermal tests in high dilution.

(3) Hyposensitization against the dust relieved the symptoms for at least three months.

(4) Peculiar sensitiveness to adrenalin.

Case 3.—A European female, aged 38 years. Duration of asthma four years. She had pleurisy 13 years previously.

Laboratory findings.—A total leucocyte count of 14,000 per c.mm. with an eosinophilia of 12 per cent and an Arneth index of 82. The von Pirquet test was positive. There was a marked response to a hypodermic injection gr. 1/20 pilocarpine nitrate, the increased salivation induced by it lasting for over an hour. Free and total gastric acidity were low. Intradermal tests with the extract of the dust collected from her room gave positive reactions in 1/1,000,000 dilution. Intradermal tests with this dust extract in 19 other asthmatics gave the following results:—

Negative	..	..	5
Positive only in 1/100	..	..	2
" " " 1/1,000	..	..	4
" " " 1/10,000	..	..	3
" " " 1/100,000	..	..	2
" " " 1/1,000,000	..	..	3
TOTAL	..	..	19

There was no attack during her stay in the hospital. The patient was given asthma mixture with tincture ephedra, an acid mixture after meals, and a course of injections of the autovaccine made from her sputum.

On one occasion she went out to her home on Saturday evening and came back on Monday morning. She continued both the asthma mixture and the acid mixture at her home. On the first evening she began to feel 'stuffy' soon after reaching her home and this feeling of stuffiness developed into an acute attack. She had the same experience on the second evening. On her return to hospital she remained free from attacks as before.

After the six doses of vaccine the blood examination showed no change, either in the eosinophilia or in the leftward shift in the Arneth count. We (Napier and Dharmendra, 1936) have observed that the patients who after a course of autovaccine do not show any improvement in the Arneth count derive little or no benefit from the treatment.

Hyposensitization against the dust was then started. A few injections were given in the hospital and the patient was discharged and told to come back regularly for her injections. The initial dose was 0.1 c.cm. of 1/100,000 dilution. It was gradually increased to 1 c.cm. of 1/100 dilution. The injections were given at first twice a week and later at weekly intervals.

During the course of the treatment she kept well except on the two occasions when during her monthly periods her breathing became heavy and she had some wheezing. There was no such trouble on the occasion of the third monthly period, by which time 13 injections of the dust extract had been given.

Intradermal testing after 12 injections showed that she reacted to the dust definitely in 1/1,000 dilution. After another six injections definite reaction was obtained only in 1/100 dilution (before hyposensitization the reaction was definite in 1/1,000,000 dilution). The patient was asked to come and report occasionally. She came back two months later and reported having kept quite free from the attacks; there were no signs in her lungs. She was seen for the last time seven months after the last injection, when she reported having kept well except for a mild attack of influenza; on this occasion also there were no signs in the lungs.

Summary of special points in the case

(1) The patient was quite free from attacks in hospital; during her stay in the hospital she spent two nights in her home, and she had attacks during both these nights.

(2) She reacted with positive intradermal tests to high dilutions of the extract of the dust collected from her room.

(3) Hyposensitization with the dust extract reduced the sensitiveness of the patient to the intracutaneous injection of dust.

(4) Hyposensitization with the dust extract kept the patient free from the attacks for at least seven months.

Case 4.—A European male, aged 42. Duration of asthma five weeks. The attacks started while he was working in the 'drawing line' of a jute mill. The only point in the previous history was that he had his tonsils removed six years previously.

Laboratory findings.—There was a total leucocyte count of 9,000 per c.mm. with an eosinophilia of 15 per cent and a normal Arneth count, the Arneth index being 66. No helminthic ova or *Entamoeba histolytica* were found in the stools. *Bacterium pseudo-carolinus* was isolated from the stool culture. A fractional gastric analysis showed high free and total acidity. There was only a slight reaction to a hypodermic injection of gr. 1/20 pilocarpine nitrate. Dermal tests with foods and epidermals gave negative results. Intradermal test with house-dust extract (that prepared for case 2

of this series) had a reaction only in 1/1,000 dilution. Samples of jute dusts from the drawing line (where the dust was heavy and where the patient was working when he started the attacks) and from the finishing department (where the dust was comparatively much less and where the patient was working when he came in for the treatment) were obtained and a 1 per cent extract was made. Intradermal tests with these extracts gave the following results:—

		Drawing-line extract	Finishing- department extract
Control	..	—	—
1/1,000,000 dilution	..	+	+
1/100,000	..	+	+
1/10,000	..	++	+
1/1,000	..	+++	+
1/100	..	+++	+++

Hyposensitization was started with the drawing-line extract, in all 23 injections being given. The initial dose was 0.1 c.c. of 1/10,000 dilution. The dose was gradually increased to 0.5 c.c. of 1/100 dilution. An attempt to increase the dose was followed on each of these occasions by an unpleasant reaction, precordial pain. The intradermal testing with the drawing-line extract after hyposensitization gave the following results:—

Control	..	..	—
1/1,000,000 dilution	..	..	—
1/100,000	..	..	—
1/10,000	..	..	—
1/1,000	..	..	+
1/100	..	..	+++

The patient was free from the attacks for three months. During the hyposensitization it was noticed the injections gave him from slight to severe headache on five occasions and pain over the heart region on two occasions.

Summary of special points in the case

(1) The attacks of asthma started when he was working in the 'drawing line' of a jute mill where he was exposed to heavy jute dust. The attacks continued on his transfer to the finishing department where the exposure to the jute dust was much less.

(2) Intradermal tests with stock house-dust extract were positive only in a dilution of 1/1,000.

(3) Jute-dust extracts both from the drawing line and the finishing department gave positive intradermal tests in high dilutions. The reactions with the drawing-line extract were more marked than with the finishing-department extract.

(4) During the course of hyposensitization general reactions were encountered on seven occasions.

(5) The hyposensitization reduced the sensitiveness to intradermal injections of the dust.

(6) The hyposensitization relieved the patient for at least three months.

Summary

(1) Four cases of dust-sensitive asthma and their treatment by hyposensitization against the dust extract are described.

(2) Two of the patients were sensitive to house dust and the other two to professional

(Continued at foot of next column)

THE UTILITY OF ANTISEPTICS AND COAGULANTS IN COMPOSTING HABITATION WASTES

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Introduction

FLY BREEDING is checked when habitation wastes are composted by the Indore process,

(Continued from previous column)

dust—one to oil-seed dust and the other to jute dust.

(3) Of the two patients found sensitive to professional dust, one did not react at all to the stock house-dust extract while the other reacted to it in a dilution of 1/1,000 only.

(4) The oil-seed-dust-sensitive case gave negative dermal tests with the oil seeds and the oils made therefrom.

(5) Two of the patients started the asthmatic attacks after moving to localities to the dust of which they were found to be sensitive. One patient suffered only in Calcutta where he was exposed to the dust he was found to be sensitive to, and remained free from any attacks when he stayed at his village residence, where the offending dust was not present. The fourth case remained quite free from attacks in the hospital; during her stay in the hospital she spent two nights at her house and had attacks on both these nights.

(6) Hyposensitization reduced the sensitiveness to the dust in the two cases in which a dermal test was done both before and after treatment.

(7) Hyposensitization had kept the patients free from attacks for one year, in one case, and for three to seven months, the total period of observation, in the others.

(8) In one case general reactions were observed during the course of hyposensitization.

(9) In one case sensitiveness to cattle hair was present, but was not responsible for the symptoms.

(10) One patient showed a peculiar sensitiveness to adrenalin injection. The injection relieved the attack, but the patient experienced a feeling of pain after the injection. The pain started at the site of injection and gradually spread to the whole body.

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provided the operations recommended for charging and turning are carefully followed. The temperature developed inside the mass is enough to kill most organisms in their active forms. Nevertheless a layer a few inches deep remains cool by its exposure to the air and so enables a small number of fly larvæ to survive. These, however, are subsequently turned into the heated mass and so killed.

Carelessness in charging may result in anaerobic 'pockets' and irregular distribution of moisture. An investigation was, therefore, undertaken to find if greater efficiency could be attained in reducing (1) the survival of fly larvæ, and (2) the irregularities in aeration and moisture in the charge without appreciable increase in costs. Antiseptics were expected to result in further reduction in fly larvæ, and the initial coagulation of night-soil in even distribution of moisture and in the maintenance of better texture in the mass. Bordeaux mixture had been reported as useful in preventing fly breeding (Rao and Subrahmanyam, 1932) but in these trials copper sulphate was used as being both antiseptic and coagulant. Ferrous sulphate and alum were also tried, all three substances being cheap and easily available.

(1) *Experiments and results; preliminary laboratory tests*

The influence of the three chemicals was tested on (a) raw night-soil diluted with about an equal volume of water and (b) on a mixture of night-soil and water as in (a) with an equal volume of chopped grass and mixed with road dust (about 1/6 by volume). The treatments were given as doses of 1, 0.5 and 0.1 per cent by volume of night-soil. Equal volumes of the mixtures with untreated controls were kept in uncovered cylinders protected against dust by ventilated glass chambers.

Group 1 (a).—Immediately after mixing the chemicals clotting began but it was granular with copper sulphate and amorphous with alum, ferrous sulphate being midway. Visible differences in the degree of clotting due to quantities were at once noticed; with copper sulphate concentrations 0.5 and 1.0 per cent were much superior to 0.1 per cent. Four hours after the non-flaky coagulation produced by alum did not show any tendency towards settling, only the one per cent treatment showing a thin layer of clear liquid at the top. In contrast with this the clots obtained with the other treatments, though distributed throughout the mass, exhibited a honeycomb texture with large inter-spaces full of clear liquid coloured by the reagent.

Next morning there was practically no change in the cylinders treated with alum but the other treatments showed a cleavage in the centre of the clotted mass. The upper portion tended to rise to the surface and the lower had sunk to

the bottom, leaving about 12 per cent space between, full of clear liquid. There was no further change even after four days.

Obnoxious odours did not develop to any appreciable extent but fly larvæ appeared on the third day in all the cylinders except those treated with 1 and 0.5 per cent copper sulphate.

Group 1 (b).—Mixtures of grass and night-soil treated with ferrous sulphate in all doses and 1 per cent alum showed layers of clear watery liquid at the bottom. Others showed no separation. All samples showed holes in the surface due to escape of gases and gradually shrank in volume. No fly larvæ nor any obnoxious odour appeared in these samples either treated or untreated, even when flies were trapped in the outer chamber. It seemed that coagulation by copper sulphate and ferrous sulphate was likely to produce a porous mass; while alum would lead to an anaerobic condition, only copper sulphate at 0.5 per cent or more could prevent breeding of fly larvæ in raw night-soil. In the presence of chopped grass, however, no larvæ appeared even without any treatment, showing that under proper conditions habitation wastes ought not to breed fly larvæ, even when antiseptics are not used.

Two large-scale tests

It was, however, decided to give a trial to chemicals on a large scale and 41 tests were carried out at the disposal grounds of the Residency Civil area. The following table shows the treatments, the number of their repetitions, the quantity and costs of the chemicals used and the results obtained.

One heap contained 7 cars (i.e., 420 gallons) of night-soil, with enough refuse to make it two feet high occupying 75 square feet.

The chemicals improved the physical condition and the moisture conservation in the heaps when mixed with night-soil before charging. Both copper sulphate and ferrous sulphate at 0.1 per cent reduced fly larvæ to some extent but copper sulphate was better. This reduction of fly larvæ was still greater when the top layer was charged with copper sulphate in higher concentration, 1.0 per cent being very effective. There was no difference in the effect observable when the lower layers were treated. Thus it became clear that in a properly-charged heap maggots can breed only on the outer surface and treatment of the surface was sufficient to check them. The subsequent test confirmed this and showed that spraying the exposed upper surface and sides of heaps after the charge and after the first turn was better than after the charge alone, and that 1 per cent copper sulphate almost completely checked the larvæ during dry weather and to the extent of 50 per cent during wet weather. It was also proved by the last test in the table that in the absence of adequate aeration the treatment altogether failed. Surface spraying had a better effect

than mixing in the night-soil. The most effective treatment required an additional cost (not including the labour for spraying) of Re. 1-12 per unit of 5 feet by 15 feet. For a lower efficiency, the extra charge will be Re. 1-5.

It seems, therefore, that some further reduction is possible in the development of fly larvæ on the surface of heaps of town waste composts

extra cost involved is a drawback to the application of this refinement which is even itself of doubtful utility for general use, because, after all, the few larvæ that are present on the surface of properly-handled heaps have no chance of hatching into flies because they are transferred to the hot interior of the heaps at the first turn. The use of chemicals in the manner

TABLE

Utility of chemicals in composting habitation waste, trials at the disposal ground, Residency Civil area, Indore, 1st June to 11th July, 1935

Quantity per heap, lb.	Cost per heap, Rs. As. P.	Treatment	Number of trials	TOTAL
<i>I. Chemicals mixed in night-soil in the cart</i>				
<i>A. Uniform rate throughout</i>				
4.2	0 9 4	Copper sulphate 0.1 per cent	2	6
4.2	0 3 0	Ferrous sulphate 0.1 "		
4.2	0 4 0	Alum .. 0.1 "		
		Control .. 0.1 "	3	3
Chemicals reduced the viscosity of night-soil and greatly improved moisture conserv. ion of the heaps. They became blackish brown with copper sulphate, grey with ferrous sulphate and black with alum. Fly larvæ were reduced most by copper sulphate, next by ferrous sulphate but not by alum.				
<i>B. Same as above but with high concentration at top</i>				
		Lower layers Top layers		
		Copper sulphate		
6.6	1 0 0	0.1 per cent 0.5 per cent	1	6
9.6	1 7 0	0.1 " 1.0 "		
		Ferrous sulphate		
3.6-3	0 9 6	0.1 per cent 0.5 per cent		
3.6-6	1 0 6	0.1 " 1.0 "		
3.0	0 7 0	Nil 0.5 "	1	1
6.0	0 14 0	Control " 1.0 "		
Fly larvæ less than control and less than the previous tests. 1.0 per cent slightly better than 0.5 per cent. Other remarks also apply.				
<i>II. Spraying on surface and sides of heaps, copper sulphate</i>				
<i>A. Both at charging and first turn</i>				
		At charge At first turn		
6.0	0 14 0	0.5 per cent 0.5 per cent	4	10
12.0	1 12 0	1.0 " 1.0 "		
9.0	1 5 0	1.0 " 0.5 "		
<i>B. At charging only</i>				
3.0	0 7 0	0.5 per cent ..	4	8
6.0	0 14 0	1.0 " ..		
		Control ..		
<i>C. At first turn only treatments given to soaked heaps in trench which was not well drained</i>				
3.0	0 7 0	.. 0.5 per cent	2	2
6.0	0 14 0	.. 1.0 "	1	1
		Control ..	2	2
				41

Spraying at both stages better than at charging alone. 1.0 per cent at both stages best but the reduction of fly larvæ was much less in heap made during the rains.

Abundant maggots and flies in all heaps not appreciably reduced by the treatments.

Cost of copper sulphate per cwt. .. Rs. 16-0
 Cost of ferrous sulphate per cwt. .. " 4-8
 Cost of alum per cwt. .. " 6-8

by spraying them with suitable chemicals, provided the charging and turning is done according to the technique prescribed. The

described seems, however, a useful safeguard when a high sanitary efficiency is aimed at,
 (Continued at foot of next page)

SUICIDE

ITS CAUSES AND PREVENTION

By J. N. J. PACHECO, M.R.C.S., L.R.C.P., I.M.D.
*Officiating Superintendent, Ranchi Indian Mental
 Hospital, Kanke*

THE average person who reads the newspapers in India cannot fail to note that, almost daily, there is to be found at least one notice of some unfortunate person taking his or her own life in some part of the country.

Practically every newspaper in India makes capital of news about suicide—some more blatantly than others—not that the news in itself is of any particular importance to its readers, but because such news is classed as 'sensational'. It is unfortunate that important newspapers do give publicity to these morbid events. The sordid details that are often given *in extenso* not only make depressing reading but invariably evoke a sense of pity for the unfortunate victim and the relations of the deceased.

The object of this article is to discuss from a medico-psychological view-point some of the main causes of suicide and to suggest possible modes of prevention.

Suicide is the perversion of the instinct of self-preservation. It is man's great retreat from life and constitutes a final regression from reality when he is unable to endure suffering in

(Continued from previous page)

because under such management the normal technique will be followed with greater precision than is possible for the average municipal bodies.

Summary

The Indore process of disposal of habitation wastes by composting permits of the hatching of some fly larvæ on the cooler surfaces of heaps freshly charged and sometimes after the first turn, though never after the second. Such larvæ cannot become flies if the prescribed turns are given.

In an attempt to guard against the escape of larvæ from the heaps and to cover departures from the process routine several antiseptics and coagulants were tested.

A 1 per cent solution of copper sulphate, sprayed, controlled larvæ well in dry weather and partially in wet, provided that the process technique was followed. Otherwise there was no effect. Hence the only benefit to be derived from this refinement lies in fewer chance-escapes of larvæ to shelter in wall crevices in improvised installations, but usually birds are found to deal with such escapes.

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the present or pain in the future. Federn holds the extreme view that suicide is perhaps the final act of a perfectly normal person, but there is much truth in the usual lay verdict of a coroner's jury, except in very exceptional cases, that the suicide was 'temporarily insane'. There can be no doubt that from whatever aspect we view this problem a psychological study and investigation of the subject will reveal the best results. Suicide may be accidental, intentional or impulsive, and it may occur in a state of sanity or insanity. The subject demands the closest attention of psychiatrists, general practitioners, and social workers in this country as well as internationally to discover some means to prevent it or at least reduce the appalling numbers which occur annually. The statistics on suicide make most alarming reading.

In reply to a questionnaire I sent to the Commissioners of Police of Madras, Bombay and Calcutta I was able to obtain the following figures for the three largest cities in India :—

MADRAS

	1932	1933	1934
(1) The total number of actual suicides.	75	66	83
Attempts at suicide ..	2	3	..
(2) Incidence according to sex.	M. F.	M. F.	M. F.
	46 29	47 19	55 28
Attempts at suicide ..	1 1	3 ..	.. ..
(3) Most usual form of suicide.	Poisoning, drowning and hanging.		
(4) Most usual motives for suicides.	Incurable diseases; family worries.		
(5) Whether suicide is more prevalent in any particular season of the year.	No.		

As regards the various forms of and motives for attempts at suicide these are more or less the same as for actual suicides.

It will be seen therefrom that the most usual method of suicide among males is poisoning. Drowning and lying on railway lines is resorted to, to a lesser extent. Among females the most usual form is burning, and poisoning to a lesser extent. They also resort to jumping from heights and drowning.

The causes that lead to suicide among males are monetary difficulties and want of employment and, among females, ill treatment at the hands of husbands or mothers-in-law or loss of children.

From the records of this office it is found that there are more cases of suicide in the hot season than in any other.

Bond, reviewing the statistics in England and Wales for the past 49 years, finds that the ratio for all ages per 10,000 of the population is 1.4 for males and 0.9 for females and that there has been a slight rise in the last decade. In 1929 there were 1,983 suicides in England and

Wales. The sex proportion is about 3 males to 1 female. However accurate these returns may be they do not represent the full incidence of the suicide rate nor that of attempts. It is estimated that sixty cases of suicide are reported daily in Germany. In New York and its suburbs there occur about 1,600 suicides a year and about an equal number of attempts at suicide. The rate per 10,000 of the population stands at 4.2 for Berlin, 5.1 for Hamburg, 5.8 for Vienna, and 2 for New York. San Diego, California, has the highest suicide rate in the United States.

San Diego is a famous health resort and is also the westernmost part of America and it has been commonly said that people 'go west' to 'die at San Diego'.

Causes

Although numerous superficial causal factors of suicide have been advanced, the great majority of the cases of suicide are definite expressions of failure of adjustment to life, hence suicide is now anything except an expression of definitely pathological maladjustment whether to oneself, to others or to the economic world. Depression or a wish to escape from insuperable difficulties is usually quoted as the prime cause, but reviewed psychologically there must be deeper motives. These are (1) *self-punishment*. The sense of guilt is often a motive for self-punishment. This can be observed in the feeling of guilt evoked in some persons by onanism especially when it is resumed after it had been discarded for a

BOMBAY (A)

Statistics on the incidence of suicides for the years 1932, 1933 and 1934

	Cutting throat		Drown-ing		Hanging		Stab-bing		Jumping out of window, etc.		Lying on railway line before moving train		Poison-ing		Shoot-ing		Burning		Total		GRAND TOTAL
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
1932 ..	1	..	9	8	4	3	..	..	4	6	4	..	43	10	1	..	1	11	67	38	105
1933 ..	6	..	9	3	6	2	..	..	4	4	10	1	74	10	2	..	2	12	113	32	145
1934 ..	3	1	7	4	4	2	2	..	3	3	5	..	58	9	2	..	2	15	86	34	120
Total according to sex.	10	1	25	15	14	7	2	..	11	13	19	1	175	29	5	..	5	38	266	104	..
TOTAL ..	11		40		21		2		24		20		204		5		43		370		370

BOMBAY (B)

Statement showing the number of attempts at suicide recorded by the Bombay City Police for the years 1933 and 1934

Year	Jan.		Feb.		March		April		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.		TOTAL	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
1933	3	..	2	1	3	2	3	3	7	3	2	3	2	4	4	2	5	3	8	..	7	..	4	3	50	24
1934	2	1	2	1	4	..	4	1	3	..	1	..	5	1	5	2	4	..	4	..	3	3	2	..	39	9

CALCUTTA

Statement of suicides for the last three years, 1932 to 1934, in the City of Calcutta

		Hindus	Mohammedans	Christians	Other classes	Due to opium	TOTAL
		1	2	3	4	5	6
1932	..	106	13	3	1	27	150
1933	..	97	8	3	1	16	125
1934	..	104	3	6	2	13	128

considerable time. Unrequited love likewise may evoke a desire to punish which may lead to suicide but here the underlying motive is not so much to punish oneself as to punish the other party by arousing in him (or her) a life-long feeling of remorse. Such forms of suicide are therefore in reality a kind of murder.

(2) *Frustration of the sexual instinct.*—Both men and women commit suicide on account of homosexuality. Hirschfeld estimates that 3 per cent of all suicides are invert. Conflicts over these tendencies in themselves, fear of social discovery and the sense of inferiority for not being as others are strong motives. Exhibitionism as well as impotency are equally strong ætiological factors. The double suicide of lovers is a symbolical gesture of attaining a 'perpetual honeymoon' by dying together. The practice of burial in the family vault or in or near the grave of a partner is a conscious counterpart of the same idea. The origin of 'suttee', once prevalent in India, is traceable to a primordial virginity taboo and not to the idea of self-immolation.

Among childless and unmarried women suicide is three times more common than among mothers and married ones. In the case of the unmarried mother, social disgrace is the main cause.

(3) *Physical pain.*—Pain that is unendurable and prolonged, whether from disease or other causes, drives the sufferer to seek relief in death. The pain of tic-douloureux, incurable tumours such as sarcoma and carcinoma and wounds in the head account for some cases of suicide. The fear of insanity is also a common cause. In the pre-psychotic stage a strong suicidal tendency may resolve itself when the psychosis is fully developed.

The analytical explanation of this fear is that the repressed unconscious conflict may break through into awareness and expose the underlying guilt complex. Should guilt have its source in hostile wishes we can understand how closely homicide and suicide are related and in fact often closely follow one another.

In extremes of hunger and thirst but more especially the latter, suicide is resorted to.

(4) *Social sufferings and fears.*—Bankruptcy, dismissal, exposure of fraud or misdemeanour, bringing ruin and social ostracism in their train, are the simpler motives for suicide in men. Among women illegitimate pregnancy is probably one of the chief causes of suicide. In India a high percentage of suicide occurs among girl wives who are harshly treated by their mothers-in-law and husbands.

Regression

Freud has formulated the hypothesis that there is an innate 'death instinct' which urges us to a state that is free from tension and responsibility. Thus there is a deep connection between suicides and certain extreme degrees of mother-fixation, a state of 'nirvana'

that is coveted. In the young, too much love from the parents renders the individual so greedy of affection that he is incapable of living without it in later life.

Sometimes the suicide is Messianic in character. The self-imposed fasting by persons for political or social reformation is of the same nature. From the standpoint of religion the lowest rate is among Roman Catholics and the highest among Protestants. This may in part be due to the great satisfaction the Church of Rome affords to the mother-complexes of mankind. The Jews are rated between these two sects.

The psychoanalytic conception of suicide is well summed up in Freud's words 'probably no one finds the mental energy required to kill himself unless in the first place he is doing this, at the same time killing an object with whom he has identified himself, and in the second place is turning against himself a death wish which has been directed against someone else. The unconscious of all human beings is full of such death wishes even against those we love'. Meninger, in his analysis of suicide, sees in it a particular kind of death having three distinct elements for each of which there appears to be always unconscious and sometimes conscious motivation in (1) the element of dying, (2) the element of killing, and (3) the element of being killed.

The legal aspect of suicide, or of attempts thereto, is that it is a crime and is punishable. Though legal enquiry may be necessary it is very doubtful whether any good results follow from regarding suicide, actual or attempted, as a crime.

Prevention

As regards psychotic individuals, suicide is a common symptom in melancholia. It is also found in alcoholism, epilepsy, anxiety states and chronic hallucinatory psychosis. Opinions are divided as to whether psychoneurotic individuals are potentially suicidal. Whatever the condition is, it is important to recognize the symptoms at the earliest possible moment.

A fallacious idea, common in medical minds, is that if any individual talks of suicide he will not carry it out. It must be remembered that if the emotional idea is strong enough it will be carried over into overt action. In mental hospital practice however one has ever to be on the alert not only to detect symptoms but to prevent all possibility of the achievement of suicide. This means constant supervision at all times. Melancholics especially should never be left unattended. They will plan and wait silently for the first opportunity that presents itself when they are alone. There is no need for restricting liberty of movement or depriving the patient of every possible instrument or article that may be used. If a patient is determined to die and has nothing to kill himself with, he may even resort to dashing his head

against the wall or floor. Close and constant attention therefore is the best preventive. Even in the stage of convalescence, vigilance must not be relaxed. Searching a patient for contraband may at times be necessary but it must be done tactfully. In private practice the physician should insist that a case of potential suicide has at least three reliable attendants, to watch him day and night.

In the case of attempts by persons not insane the main aim of prevention should be the elimination of the cause that leads to it and, further, the reformation of the individual towards a happier outlook and adjustment of life. There is no doubt that a good deal can be done to retrieve unfortunate persons with these propensities.

As stated previously, one of the causes of suicide among Indian females is ill treatment by husbands or mothers-in-law and such cases are frequently reported. Among orientals the position of the mother-in-law in the home is supreme and it is to be expected that the husband invariably submits to or aids his mother. The mother-complex still operates to a high degree. It is curious that one never hears of a man committing suicide because of his mother-in-law's domination, nor does one ever hear of suicide among European women—and never of European men—because of quarrels with the mother-in-law. On the contrary the mother-in-law among Europeans is the butt of a good deal of fun, especially on the stage.

It would seem proper therefore that the incidence of suicide among females on this score may be reduced if the mother-in-law could be restrained or relegated to a subordinate position in the home.

With the raising of the marriage age, the advancement of female education and culture, it may be possible for the Indian bride of the future to demand that she be mistress in her own home or even stipulate to live apart from the rest of the family. This of course is essentially a matter for social reformers, but it is more likely the women themselves will be all too willing to throw off the yoke of the mother-in-law.

It would be interesting to know the annual figures for suicide among girl wives before and since the passing of the Sarda Act. I feel that one effect of the Sarda Act—which was probably not foreseen—will be the gradual diminution and final disappearance of the figures for suicide from this cause.

In certain countries, especially Germany, Soviet Russia, Norway and the United States, there are societies or bureaux to which cases of attempts at suicide are taken for advice and treatment. The police especially refer all cases to the bureaux. The question of punishment does not arise, and the main and only object of the bureaux is the reformation and rehabilitation of the individual.

It is significant that a measure of reform is now being considered to amend the London Coroner's Act. The verdict 'suicide' is to be replaced by 'died by his own hand' and the usual qualifying remark 'while temporarily insane' by 'while in a state of disordered mind'. Further, coroners are enjoined to confine themselves to actual statements of fact and to refrain from passing unnecessary remarks or comments on the case. The lay press are also exhorted not to publish cases of suicide as glaringly as is done at present.

Unfortunately nowhere in India is to be found any society or bureau where cases of attempts at suicide can be referred for treatment.

The incidence in large cities can be definitely reduced by the formation, in each, of societies or bureaux to assist those who contemplate or attempt suicide. Pastors, teachers, doctors, social workers and even the Government should be invited to form centres where help, advice, encouragement, psychiatric investigation and treatment can be given to re-educate, re-adjust and reform these unfortunates. Publicity should be given to the existence of such centres where people can apply for help. Police, coroners and magistrates could help by referring all cases brought to their notice to the bureaux. It is to the credit of the Salvation Army that it is the one body that has done the most for the prevention of suicide in many countries. Journalists and the lay press could assist a good deal by refraining from reporting the sordid details of cases and thereby stem the abnormal interest that this type of sensational news attracts.

Lastly the law in relation to suicide and attempts thereto should be revised. To regard suicide as a crime serves no useful purpose. Reform and not retribution is the only solution to retrieve those who attempt or contemplate self-destruction.

A Mirror of Hospital Practice

THE INCUBATION PERIOD OF ORIENTAL SORE

By L. EVERARD NAPIER, M.R.C.P. (Lond.)
and

K. C. HALDER, L.M.F.

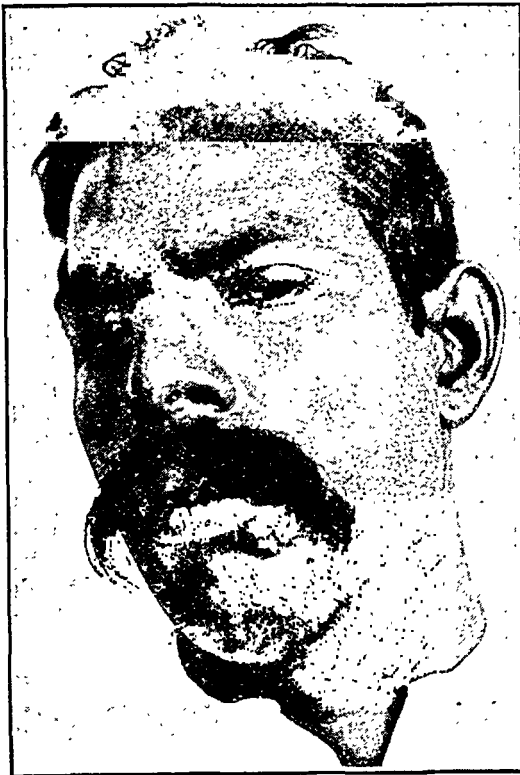
(From the School of Tropical Medicine, Calcutta)

THE incubation period of oriental sore is very variable. It may be as short as a fortnight (Marzinowsky and Schourenkoff, 1924; Keelan, 1913) and many instances have been reported in which it was at least a year. Keelan (1913) reported a case in which the sore made its first appearance a year after the patient had left the endemic area. Wenyon inoculated himself and the first clinical evidence of infection appeared about seven months later. The incubation period is usually considered to be between six weeks and four months.

Recently, a patient attended the outdoor department of the Calcutta School of Tropical Medicine with the following history :—

He was a male, aged 32 years, a native of Bikanir (Rajputana). He had however lived in Calcutta for 3½ years and had never left the city during this period. Four months ago he had noticed a small pimple on the bridge of his nose; this gradually increased up to the present size.

He had a granulomatous tumour on the bridge of his nose, extending on to the sides of the nose, involving an area of about 1½ by 2½ inches; in the centre of the tumour the skin surface was raised by about a third of an inch. It was covered by red thinned-out epithelium and there was a small ulcerated area at the apex of the tumour, over which a scab had formed. The tumour was not movable on the deeper structures. It was not painful. Under the scab the ulcer was shallow and exuded a clear serous fluid. He had no other skin lesions.



A smear was made from material obtained from the non-ulcerating part of the nodule, and abundant leishmania were found.

A photograph of the patient is shown.

The lesion was a typical oriental sore, and had none of the characteristics of post-kala-azar dermal leishmaniasis. The patient gave no history of any febrile attack since he had lived in Bengal. His home in Rajputana is an endemic area for oriental sore.

He stated quite emphatically that the lesion had only appeared four months ago and that he had never been out of Calcutta for 3½ years.

This appears to be an instance of oriental sore in which the incubation period was more than three years. Manson-Bahr (1935) says 'The incubation period of oriental sore is variously stated in days, weeks, or months'.

This might now be revised to 'in days, weeks, months, or years'.

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AN EXTREME CASE OF TISSUE ABSORPTION CAUSED BY A NÆVUS

By M. S. WAGLE, L.M. & S.
Gadag

A FEMALE child, aged 2 months, was brought on account of a discharge from its right ear. On examination, I found that the child had no trace of the external ear on the right side. Pus was coming from the external auditory meatus and there was an extensive nævus, extending from the right mastoid process across the cheek, the right eyelids, the right side of the nose and the right upper lip.

The mother gave the following history :—The child was apparently quite healthy when born. On the sixth day after birth it developed a small dark red spot on the skin over the right mastoid process. Gradually it spread forward and covered the ear on the same side. As a result of this invasion, the ear began to disappear, though there was no ulceration. In about a month and a half, the ear had completely disappeared without leaving any raw surface. About the same time a purulent discharge appeared from the external auditory meatus.



On further examination I found that the upper eyelid and the upper lip on the right side were becoming absorbed. The changed contour of the lip can be clearly seen in the photograph.

The remarkable points in this case are :—

- (1) The nævus has caused absorption of tissues, including skin, muscle and cartilage.
- (2) The absorption is not caused by ulceration.

[Note.—This is apparently a cavernous angioma. It is caused by active cystic degeneration in a vascular nævus and may involve all the body tissues, even bone. The structure of the growth resembles that of the corpus cavernosum. The prognosis in these growths is uncertain as they may cease extending at any time and finally disappear as age advances. Cavernous angiomas usually begin in the first year of life following a trauma, but occasionally they may be congenital; the case reported here is apparently in the latter category.—Farror, I. M. G.]

Indian Medical Gazette

DECEMBER

GLAUCOMA AND EPIDEMIC DROPSY

IN the issue of December 1934 attention was drawn to the importance of epidemic dropsy and glaucoma in connection with the study of the glaucoma problem as a whole. It was pointed out that in epidemic dropsy we had a disease complex or syndrome, one of the clinical expressions of which was primary glaucoma. This is the only example known of primary glaucoma forming part of a recognized disease. It was suggested in that note that Calcutta workers had a golden opportunity for research on the glaucoma problem, inasmuch as epidemic dropsy was confined to Bengal and the isolation of this condition and the investigation into its aetiology had been Calcutta's peculiar preserve. It is pleasing now to see that this opportunity of investigating the glaucoma problem has been utilized. In the *British Journal of Ophthalmology* of June 1936 is an article by Lieut.-Col. E. O'G. Kirwan on 'The aetiology of chronic primary glaucomas' in which he discusses a research on the primary non-congestive glaucoma associated with epidemic dropsy. He touches on the aetiology of epidemic dropsy, favours the Gram-positive organism which develops in stored rice and may remain as an inhabitant of the bowel even after the consumption of diseased rice ceases, as the agent responsible for the production of a toxin which is the cause of the trouble. He discards an aetiological relationship with beri-beri, an opinion founded on the experience of other Calcutta research workers. It would be well if this beri-beri association could be definitely disproved, and in view of Dr. Platt's work in Shanghai on the pyruvic acid content of the blood in B₁ deficiency, there seems no reason why the matter should not be cleared up by applying his criteria to epidemic dropsy cases. It is understood that work on these lines has recently been undertaken at the Calcutta School of Tropical Medicine and the All-India Institute of Hygiene. This however is not for the ophthalmologist, and meantime the toxin produced in rice, or in the presence of rice in the intestinal canal, is accepted as the hypothetical agent responsible for the tissue changes and clinical findings in epidemic dropsy. As Col. Kirwan says the two outstanding manifestations are vasodilatation of the whole capillary system and an increased permeability

of the capillary endothelium. There is no evidence of an inflammatory process in the uveal tract, merely capillary dilatation. The toxins concerned are said to resemble an 'H' or histamin substance, and since histamin is theoretically capable of producing glaucoma by capillary dilatation it was natural enough to look for 'H' bodies in the aqueous in epidemic dropsy glaucoma. The author found a histamin reaction 7 times out of 23. As the methods of detection of histamin in solution although very sensitive must necessarily be liable to considerable experimental error when one is dealing with minute volumes of aqueous (since mere touching of the iris may produce a histamin reaction), such a small number of positives does not justify the contention that the 'H' bodies are provocative agents in this particular problem: nor does the author elaborate this idea. He rather concentrates on more obvious features, namely, the condition of the epidemic dropsy patients' blood, of the capillary endothelium, and the resultant changes in the intra-ocular fluid. He holds that the primary factors in the production of an increased amount of aqueous humour in the eyeball are:—

- (1) Decrease in the colloid osmotic pressure of the serum.
- (2) Increase in the permeability of the capillary wall so that the albumin molecules can pass into the aqueous.
- (3) Increase in the hydrostatic pressure on the blood capillaries.

As Chopra and his co-workers have shown the epidemic dropsy patients' serum is lacking in the albumin fraction, while the globulins are increased. Kirwan points out that the aqueous of epidemic dropsy cases shows a very marked increase of albumin while the globulins remain the same. In addition the whole uvea shows a marked dilatation of the capillaries without inflammatory evidences. Here we have all the factors theoretically necessary for an abnormal rise in intra-ocular tension, and in clinical experience such tensions are observed. One might almost think of the epidemic dropsy aqueous as a 'plasmoid' aqueous without the inflammatory factor usually associated therewith, or style it an 'albuminoid' aqueous.

Col. Kirwan's paper is most interesting and a valuable contribution to the glaucoma problem in general. No doubt there is still a great deal to be elucidated in connection with epidemic dropsy and the glaucoma associated therewith, but material is still available, and the work already done forms a good foundation on which to base clearer views of an obscure intra-ocular condition for long the ophthalmologist's slough of despond.

R. E. W.

MEDICAL PUBLICATIONS IN INDIA

THE most widely-preached gospel in almost every country in the world at the present day is nationalism. Every country is not only trying to shut out the merchandise but also the influences of other countries. Whether this wide-world cult of intense nationalism will be considered 'a good thing' by the historian of the future, or whether it will lead to provincialism, thence to parochialism, and eventually to a chaotic state of affairs, we will not attempt to foretell, but it has certainly brought in its wake some very definite advantages to individual countries; it has led them to develop their own resources and they often find that these are richer and more suitable to their own requirements than those on which they have hitherto relied.

It will however be a bad day for any country when an attempt is made to carry this nationalism into the realms of science, and, as we are concerned particularly, into the realm of medical science; Russia, we believe, contemplated this but very soon abandoned the attempt. In medical schools in India, we rely largely on British and American textbooks, and it would be the height of folly not to take advantage of the spade work already done for us and presented in a form suitable for the student of any country where the English is the language of science; we should take the same attitude towards books dealing with advances in medical science for the use of the post-graduate reader, as 90 per cent of their contents is directly applicable to conditions encountered in this country.

In India, attempts are made from time to time to supply the needs of her students from an indigenous source and to publish books on general medicine or surgery that are nothing but transcriptions or compilations from British and American textbooks, with all the teaching inapplicable to tropical conditions slavishly repeated; this type of book usually fails in its purpose and does nothing to further the scientific status of the country. The book however that is needed in India is the one that supplies accurate and first-hand information on the 10 per cent, on which the foreign textbooks are silent or misleading, and written by workers in this country who have had special and considerable experience of the subjects on which they write. Many such books have been published in India, some of which have become the standard works on their respective subjects, and two, at least, have appeared during this year; both have been reviewed in these columns but perhaps it will not be inappropriate to make a further short reference to them here. Colonel Chopra's *Handbook of Tropical Therapeutics* breaks entirely new ground. The writer in his 26 years in the Indian Medical Service has gained practical experience in many parts of this peninsula and in East Africa, and for the

last 16 years he has taught pharmacology at the Calcutta Medical College and at the Calcutta School of Tropical Medicine; at the latter institution, of which he is now the director, he has had an extensive experience of experimental pharmacology and practical therapeutics throughout this period. The results of this vast experience he has summarized and presented in his book. A book of this kind was certain of a good reception in India, but, from the laudatory reviews it was given in the leading medical journals in other countries, it is obvious that its importance as a contribution to medical science has been fully appreciated. The *Tropical Diseases Bulletin* in discussing the sections on malaria remarks 'Dr. Chopra's account of the treatment of the disease is amongst the best that have appeared so far and it bears unmistakable evidence of his own experience and critical powers of judgment'. The other book to which we refer is the new edition of *Birch's Management and Medical Treatment of Children in India and the Tropics*; this is of course not a new book—its predecessors have served mothers in India for nearly a hundred years—but the present edition has been almost entirely re-written by Colonel Vere Hodge and the scope of the book has been widened to serve the physician as well as the mother. Standards for the feeding of children have been laid down which are suitable for children in the tropics and differ materially from those that will be found in ordinary textbooks of pediatrics. For the last sixteen years Colonel Vere Hodge, who is now the First Physician at the Medical College in Calcutta, has had exceptional opportunities of studying diseases in children, not only tropical diseases but other diseases such as typhoid, rheumatism, diphtheria and digestive disorders, which sometimes present a very different clinical picture in this country and always demand a course of treatment modified to suit tropical conditions. Where tropical diseases are concerned, the author, though his own personal experience is a wide one, has collaborated with others who have had special experience in these diseases, mostly members of the staffs of the Medical College or Calcutta School of Tropical Medicine. This is not by any means a complete textbook of pediatrics for the tropics, but, whilst it maintains its practical usefulness for the mother, it provides the physician who reads it in conjunction with a standard book on pediatrics, such as Garrod's or Pearson and Wyllie's *Recent Advances*, with just that information for meeting the special conditions which writers whose experience is limited to temperate zones are unable to provide.

Books of this kind are not only invaluable to the practitioner both in India and in other tropical countries but do much to raise the status of scientific medicine in India in the eyes of the world.

Special Article

THE TECHNIQUE OF TONSIL ENUCLEATION

By H. WILLIAMSON, O.B.E., M.D., F.R.C.S.E., M.R.C.P.,
MAJOR, I.M.S.

Foreign and Political Department, Government of India

ALTHOUGH this operation is simple, safe, short and effective, and needs only such instruments as are to be found in any Indian hospital, it seems to be done by surprisingly few people. As any examination of school children's throats will show that there is no lack of material, it must be assumed that there is a lack of familiarity with the details of technique, careful attention to which is necessary for success, so it may be helpful to set these forth.

A full discussion of the indications for tonsillectomy is beyond the scope of this article, but it is generally agreed that tonsils should be removed when they obstruct respiration, become frequently inflamed, or cause more than temporary enlargement of the glands behind the jaw. Inflamed, oedematous tonsils should not be mistaken for chronically enlarged ones, as their removal may be followed by severe hæmorrhage, so in doubtful cases it is best to try the effect of a week's gargling. Fibrotic atrophied 'septic-focus' tonsils should be dissected out, but large tonsils are more loosely attached, especially in children, and can be easily and completely removed with the blunt guillotine. The wise beginner will operate first on children, preferably about five years old: he will also enquire about any history of bleeding.

Instruments

The guillotines supplied to Indian hospitals are usually sharp, but the blade can be suitably blunted on a file and oilstone, or a bazaar *mistri* will do it for a few annas. The perfect blade is as blunt as a silver butter knife, in fact it is difficult to make it too blunt. When the blade has been blunted the surgeon should see that it shuts properly; if it does not, the slot in the shaft should be lengthened with a small file until the blade goes well home into the ring of the instrument. Except for enormous tonsils, guillotines of the two smaller sizes suffice, as too large a guillotine is apt to damage the soft palate or uvula, and the tonsil cannot be crowded into it, while too small a one will not take the whole tonsil.

Doyen's mouth gag is very satisfactory, as it gives a good view and does not get in the way. A tonsil punch forceps is useful in case the lingual or pharyngeal tonsil does not come away cleanly. An adenoid curette, some

Spencer Wells and Kocher's forceps, some swabs and a bowl of iced water complete the outfit. I use forceps instead of swab holders as they are quicker to load, stronger, and less liable to drop a swab. The best light is a good headlight, but a powerful electric torch held by an intelligent nurse or assistant does very well.

Position of the patient

The patient lies on his back with the head well extended.

Anæsthetic

It should be remembered that when chloroform is given to children, especially if they go under quickly, the anæsthesia may deepen for about two minutes *after the mask is removed*. This may be a source of great danger from asphyxia due either to the chloroform itself or to obstruction of the airway by blood clots. It is therefore safest to give a preliminary injection of atropin and to use a chloroform-ether mixture. As soon as the patient's jaw relaxes the mask is removed, the Doyen's gag inserted and the operation begun. With a perfect anæsthetic the coughing reflex is hardly lost and the patient begins to 'gag' as the second tonsil is removed. I have not found basal anæsthesia very suitable as the patient is unconscious for longer than necessary and the depth of anæsthesia is difficult to control. A local anæsthetic is more suitable for dissection, but I have used it once or twice for enucleation in nervous adults.

The operation

Step 1.—Doyen's gag is inserted between the patient's incisor teeth, with the handle on the left cheek, and is opened wide enough to give a good view of the back of the throat. Two points require attention, breathing should not be obstructed and the jaw should not be dislocated. A quick operator does not worry much about the former, which can be prevented by twisting the gag a little so as to bring the lower jaw forward, or the gag may be closed slightly. Dislocation of the jaw, it need hardly be said, should not occur, but if it does, reduction should be deferred till the operation is finished, and is quite easy under the anæsthetic. I have seen it happen once or twice, but no ill effects seemed to follow, though it cannot be called beneficial.

Step 2 (figure 1).—The operator stands at the patient's right side, facing the mouth. The closed guillotine held in the right hand is inserted, the back of the patient's tongue pressed well down, and both tonsils examined.

Step 3 (figure 2).—The right tonsil is dealt with first. The blade of the guillotine is opened and the ring pushed underneath the tonsil, between it and the posterior pillar of the fauces.

The tonsil is now lifted towards the nasopharynx, the operator's left thumb helping to engage it in the guillotine.

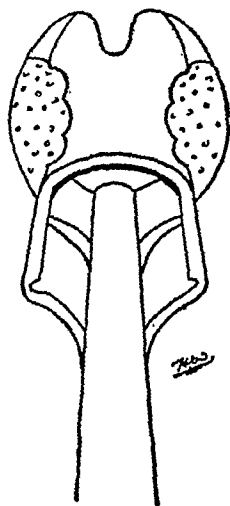


Fig. 1.—Inspecting the tonsils.

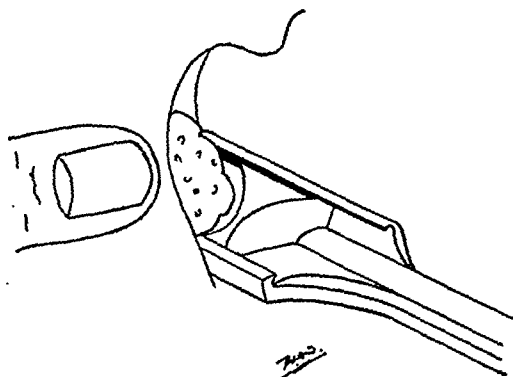


Fig. 2.—Lifting the tonsil on to the guillotine.

*Step 4 (figures 3 and 4).—*This is the most important step of all, and on its correct performance depends the completeness with which the tonsil is removed.

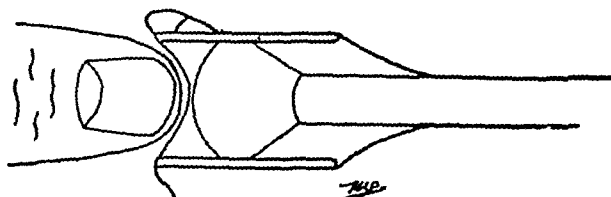


Fig. 3.—Pressing the tonsil forward with the guillotine and pressing it into the ring with the left thumb.

The guillotine is turned so that it lies as nearly as possible across the mouth, with the blade facing the operator, who pushes the ring of the instrument into the space between the tonsil and the posterior pillar, and at the same time presses the distal end, and hence the tonsil, well forward, while his left thumb continues to press the tonsil lightly into the hole in the guillotine. The instrument is now drawn towards the opposite side, thus bringing the tonsil towards the mid line and stretching the anterior pillar. When this is done the

surgeon's left thumb presses the tonsil firmly and completely into the hole in the guillotine. The effect of this manœuvre, which perhaps sounds intricate but is really quite simple, is not only to engage the tonsil fully, but also to turn the pillars of the fauces practically inside out, a point not always realized: the

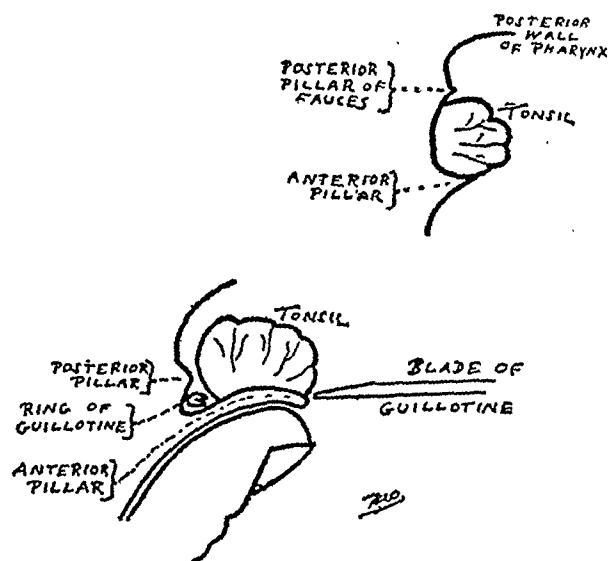


Fig. 4.—Horizontal section through figure 3, showing the tonsil in position for enucleation. The upper figure shows the normal position by way of contrast.

line of cleavage is thus made straight or slightly convex. Figure 4 shows the position in horizontal section. It also shows how the anterior pillar may be damaged if the guillotine is not lying across the mouth, or button-holed if the left thumb presses too hard. When the manœuvre is correctly carried out the left thumb will feel a very distinct dimple as soon as the whole tonsil has passed through the ring. *Until this dimple is felt the operator can be sure that the tonsil is not fully engaged, and must not close the blade.* A careful watch should be kept to see that the uvula is not dragged in too.

The smallest guillotine that will fit the tonsil snugly is the best, in fact the smallest size supplied to hospitals does for most cases, but if the tonsil is so big that it cannot be pushed right in and thus produce a good dimple a larger instrument should be used.

When the tonsil is thus properly engaged the blade of the guillotine is pushed firmly home, care being taken that it passes exactly between the tonsil and the anterior pillar, while the left thumb keeps the tonsil in position. As the blade passes under the thumb the pressure of the latter should be suitably relaxed to prevent button-holing of the anterior pillar, and when the blade is home the left thumb is removed.

From now until the tonsil is outside the mouth it is absolutely essential to keep the blade of the guillotine tightly pressed home,

otherwise the tonsil will slip and be incompletely removed, in fact, I use both hands and press with both thumbs, as this gives more command of the guillotine and increases the pressure on the blade. With the blunt blade there is no danger that the surgeon will cut through the tonsil prematurely and have the mortification of seeing it disappear down the pharynx.

Step 5 (figure 5).—The tour de maître, so named by Samuel Whillis, the inventor of the operation, is begun as follows: the operator's right hand is pronated and the left supinated,

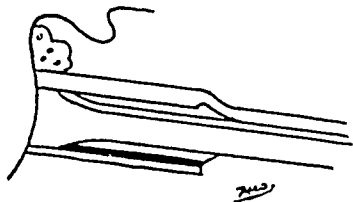


Fig. 5.—Beginning of the *tour de maître*. The tonsil is being twisted out of its bed.

so that the tonsil, now lying on the back of the instrument, is twisted upwards towards the naso-pharynx, and drawn out of its bed.

Step 6 (figure 6).—The tour de maître is continued until the right wrist is fully pronated and the left fully supinated, so that the back of the guillotine, with the tonsil on it, faces

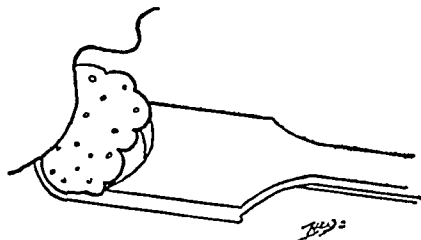


Fig. 6.—The *tour de maître* is completed and the tonsil is avulsed.

the hard palate. A fairly sharp yet purposeful tug towards the opposite side now completely avulses the tonsil, which usually comes out 'dragging its tail behind it'. The final pull may need a little force, a point not always realized at first, but a little practice teaches one just how much to use. One must also remember to maintain the pressure on the blade with the thumbs.

Step 7 (removing the left tonsil).—The operator stands by the patient's right shoulder, facing the left one, and the guillotine is again taken in the right hand, but the *tour de maître* is of course carried out by supinating the right wrist and pronating the left, so as to turn the tonsil up towards the naso-pharynx as before. I have noticed that beginners often find the left tonsil harder to remove than the right, but the trouble is overcome if, as pointed out in step 4 above, the tonsil and anterior pillar are drawn well into the mid line and at the same

time pressed firmly forward by the guillotine; this also helps to make the tonsil more visible by clearing it of the blood at the back of the mouth. The anterior pillar flattens out and the dimple is easy to make with the left thumb. If it is difficult to engage the tonsil in the ring of the guillotine the left index finger should be passed under the lower pole and guided in.

Step 8.—The tonsil beds are now felt carefully with the finger, or swabbed out and inspected. If any small pieces have been left behind they are removed with the punch forceps, while a larger fragment, if attached to the back of the anterior pillar, may be pressed into the guillotine and avulsed. If the operation has been well done the tonsil beds will feel quite smooth, but tags of muscle must not be mistaken for pieces of tonsil.

Removal of adenoids.—The right forefinger is passed up behind the uvula, and the posterior wall of the naso-pharynx palpated. For some reason adenoids are far less common among Indians than are enlarged tonsils, but if they are present they are felt as definite soft masses on the back wall of the naso-pharynx. If adenoids are to be removed, the left forefinger, with the pad towards the operator, replaces the right and firmly hooks the uvula and soft palate forward. The adenoid curette is inserted well up behind the soft palate and not more than two firm sweeps made down the back wall of the naso-pharynx. If the patient is 'gagging' this may be a little difficult, and the operator must make sure that the curette is behind the soft palate and not in front of it! It should be remembered that as the cage of the curette is curved the handle should be held towards the patient's head, so that the blade and not the heel of the instrument is against the adenoids. I like St. Clair Thomson's curette, as the teeth of the cage prevent the adenoids from dropping. The blade must be sharp.

The operation being now finished, the patient is turned on his side, with the head lowered enough to allow the blood to run out of the mouth and nose, but not so as to impede the venous return. The face is now well splashed with iced water, which usually stops the bleeding, and the gag is removed.

Hæmorrhage

As the blunt blade crushes the vessels instead of cutting them excessive hæmorrhage is rare if the tonsils are not actively inflamed or the patient a bleeder.

Occasionally, however, severe bleeding may occur, and the surgeon should have a definite plan of campaign. I have found the following method successful. Some more anæsthetic is given and the mouth gag re-inserted. The patient's tongue is now well depressed; the pharynx well swabbed, and a hot swab on forceps firmly pressed into each tonsillar fossa

and held there for five minutes by the clock. One swab is now removed and if no bleeding occurs the other is removed also. If a bleeding point can be seen it is caught in Kocher's forceps. If for any reason it is impossible to see exactly where the blood is coming from, the upper and lower poles of each tonsillar fossa are caught in Kocher's forceps: as the blood supply of the tonsils comes from these points this manœuvre stops the bleeding, though if the mouth is well opened and the tongue

well depressed it is usually possible to see the bleeding points. The forceps should be left on for three or four hours, or the tissue caught in them tied off with a slip knot run down the blades of the forceps. As this is not so easy as it sounds those who have not practised it are advised to leave the forceps in position for a few hours, during which some morphia and hæmoplastin may be given subcutaneously and 10 c.cm. of 10 per cent calcium chloride intravenously.

Medical News

FOURTH COURSE OF POST-GRADUATE INSTRUCTION IN MALARIOLOGY, UNDER THE AUSPICES OF THE LEAGUE OF NATIONS, SINGAPORE, APRIL 1937

The League of Nations is arranging for a fourth Course of Instruction in Malariology which will commence at the King Edward VII College of Medicine at Singapore, on Monday, 19th April, 1937.

The object of the course is to complete the training of medical practitioners who are engaged, or intend to be engaged, in the work of malaria control in their own countries. The course will thus be of interest not only to Governments and municipal authorities, but also to all medical men practising in Eastern countries, particularly those engaged in estate work.

The course will comprise two stages, one consisting of theoretical, clinical and laboratory studies with practical demonstrations, and the other devoted entirely to practical field studies.

The first stage will commence on 19th April and continue until the end of May. It will be carried out partly at the King Edward VII College of Medicine and partly at the Tan Tock Seng Hospital, Singapore.

The second stage will commence at the beginning of June, when candidates will proceed in groups either to Indo-China, the Netherlands Indies, or Malaya, where they will have the opportunity to study the routine work of malariologists and the application of control measures under field conditions. This stage of the course will last 14 to 21 days.

CONDITIONS OF ADMISSION

The course is open to medical practitioners, from whom application for admission will be received up to 27th February, 1937.

FEE

The fee for the whole or any part of it is Seventy-five Straits Dollars (\$75), payable in advance.

FELLOWSHIPS

The League of Nations is making available a limited number of fellowships which will only be granted to candidates nominated by their Governments or semi-official institutions.

GENERAL

Further information concerning the conditions governing the granting of fellowships or admission to the course will be supplied on application to the Director, League of Nations Eastern Bureau, 336, River Valley Road, Singapore.

SYLLABUS: THEORETICAL, CLINICAL AND LABORATORY STUDIES, WITH PRACTICAL DEMONSTRATIONS

I. ENTOMOLOGY.

This section of the course will comprise lectures and practical laboratory work spread over a period of four weeks lasting for approximately 58 hours.

Syllabus.—The detailed morphology of anopheline imagines, pupæ, larvæ and ova. The oecology of imagines, larvæ and ova; physical and biotic autoecology, synecology. The genus *Anopheles*, its classification and affinities; the species and categories below the species; geographical and seasonal distribution; the characteristics of the principal carriers of the world. Susceptibility; influences determining the efficiency of carriers. The determination of species in all stages; the use of keys and original descriptions in a study of the Eastern fauna. The technique of laboratory and field investigations.

II. HÆMATOLOGY AND PROTOZOOLOGY.

A series of lectures and laboratory classes comprising ten lectures and seventeen hours' practical laboratory work.

Syllabus.—Blood cytology, staining methods, enumeration methods. General consideration of the Protozoa with particular reference to the Sporozoa (*Plasmodium*, *Hæmoproteus*, etc.). Detailed study of the malarial parasites. Malaria in birds, monkeys and other animals. (A more detailed syllabus will be available before the course begins.)

III. PATHOLOGY.

Immunity under experimental conditions. A series of lectures, demonstrations and laboratory studies lasting ten and a half hours.

Syllabus.—Nature of the malarial paroxysm. Pathogenicity of malaria parasites—virulence of parasite and susceptibility of host. Changes in organs and tissues in acute pernicious, in benign, in chronic and latent malarial infections, and in superinfections—correlation with clinical syndromes. Toxins, changes in the blood; cellular, biochemical and immunological. Immunity—natural immunity and acquired immunity (resistance, tolerance, premunition). Cellular basis for immunity. Antibodies. Factors influencing immunity—therapy, splenectomy, blockade, etc. Duration of immunity. Relapse. Spleen size and parasite prevalence in relation to immunity. Infection and superinfection under experimental conditions. Strains of malaria parasites—specificity; importance in relation to specific therapy and epidemiology.

IV. CLINICAL.

A series of lectures and clinical demonstrations extending over a period of four days.

Syllabus.—Demonstration of selected cases and discussion. Relapses and resistance to malaria; provocation of attacks. Induced malaria; delayed manifestations; complications and sequelæ. Toxicology in relation to the use of quinine and other drugs. Determination of what constitutes a cure. Blackwater fever.

V. THERAPEUTICS.

A series of six lectures of one hour each.

Syllabus.—Plasmoquine, Fournau 710, Atebrin, arsenicals and other preparations. Pharmacology and toxicology; dosage and administration. Therapeutic effects; effects on the various stages of the parasites; effects on relapses. The present status of synthetic drugs in comparison with quinine and its derivatives.

VI. EPIDEMIOLOGY.

A series of 12 lectures of one hour each.

Syllabus.—Methods and interpretation of results; measurement of malaria (spleen rate, parasite rate, sporozoite rate, etc.) and the estimation of its prevalence and intensity; statistical analysis of data. Spleen—theory. Endemicity, epidemicity and pandemicity, their characteristics and the factors involved. The prediction of epidemics. Topographical, climatic and social factors. Anophelism *sine* malaria.

VII. CONTROL.

A series of lectures and lecture demonstrations will be given occupying a minimum period of 60 hours. Field demonstrations on urban malaria control will be arranged through the courtesy of the Municipal Health Officer, Singapore. Opportunity will be given to students to familiarize themselves with field conditions in association with the theoretical lecture courses in Entomology and Epidemiology.

Syllabus.—The history of malaria control in Singapore. The organization of anti-malaria services in urban and rural areas. The classification and application of malaria control measures. The importance of drainage. Special control and the choice of methods suitable to a particular locality. The influence of biological knowledge on the control of malaria. The limitations and uses of larvicides. Malaria surveys; the measurement of malaria in the field. The relative cost of malarial endemicity. Temporary (recurrent) and permanent control measures, their efficiency, cost and financial benefit. Anti-malaria legislation and propaganda.

VIII. SPECIAL LECTURES.

A series of lectures on the work of the Malaria Commission of the League of Nations; on the problems in various Eastern countries, and on particular subjects, extending over a period of 10 to 12 hours.

BOMBAY MEDICAL COUNCIL

The following extracts from a summary of the proceedings of the meeting of the Bombay Medical Council held on 7th September, 1936, are published for information:—

The council proceeded to consider further the application of Mr. K. A. Nanavutty for permission to be registered under section 7 (3) of the Bombay Medical Act, VI of 1912, and decided that Government be informed that the council is unable to recommend the grant of permission to Mr. Nanavutty to be so registered.

The council proceeded to consider further the application of Mr. G. S. Kasyapi, L.M. & S., for the restoration of his name to the Bombay Medical Register and resolved that sufficient time has not yet elapsed before his application for the restoration of his name to the register can be entertained.

The council proceeded to consider the application of Mr. R. S. Shah, M.B., B.S., of Rajkot, for the restoration of his name to the Bombay Medical Register and resolved that, in view of the information since received by the council about Mr. Shah, his application for the restoration of his name to the register cannot be entertained.

The council proceeded to consider the reference from the Bihar and Orissa Council of Medical Registration regarding the report of the sub-committee appointed by that council to lay down a minimum standard of qualification for purposes of registration and it was

decided that, while the courses and improvements suggested by the sub-committee are very desirable, they would require a course of studies for five years.

The council proceeded to consider the enquiry received from the Medical Council of India on the following points:—

(i) Whether Indian nationals who have obtained medical degrees of repute in foreign countries with which there is no reciprocity with India should be granted recognition of these degrees in India?

(ii) On what basis the nationals of such countries be recognized when they come to India?

(iii) What is the present practice in both these respects in your council?

And decided that the Medical Council of India be informed as follows:—

(i) Indian nationals who have obtained medical degrees of repute in foreign countries with which India has not established reciprocity should not be granted recognition of these degrees in India.

(ii) The nationals of such countries, when they come to India, should not be recognized unless they obtain a qualification registrable by the Bombay Medical Council.

(iii) Such medical qualifications possessed by both these classes of nationals are not recognized at present for registration by the Bombay Medical Council.

The council proceeded to consider further the draft revised Code of Medical Ethics and decided that it should be referred back to the executive committee for re-consideration.

The council proceeded to consider certain suggestions received from Government regarding the proposal to institute a provident fund for the staff of the council and decided that—

I. The registrar be allowed to join the provident fund, whether he is a retired Government official or not.

II. So far as the clerk is concerned, his joining the proposed provident fund should be voluntary.

III. The suggestion of Government, *viz.*, that the rate of contribution of subscribers be fixed at 1/16th of their pay, be accepted.

The council proceeded to consider the following proposals made by Mr. M. N. Talati, L.C.P.S., a member of the council:—

'That, of the six nominated members, Government be requested to nominate at least two of them from the class of general medical practitioners who are not consultants'.

'That the executive committee shall consist of the president and five members of the council and *not* six as at present'.

And it was decided that the council is not in favour of either of the proposals made by him.

The council proceeded to consider a proposal received from Mr. M. N. Talati, L.C.P.S., a member of the council, for the appointment of a committee to prepare a programme for the celebration of the 'Silver Jubilee' of the council next year and it was decided that the council is not in favour of the proposal.

The council proceeded to consider the annual returns showing the results of the several professional examinations held in 1935, compiled in the council's office from the returns supplied by the licensing bodies pursuant to the rules of the council and it was decided that a copy of these returns, indicating the failures by each of the examining bodies, be forwarded to the College of Physicians and Surgeons of Bombay and that the attention of the college be drawn particularly to the results shown against the several schools affiliated to the college.

ABSTRACT OF THE MINUTES OF THE MEETING OF THE BENGAL COUNCIL OF MEDICAL REGISTRATION HELD ON THE 22ND JANUARY, 1936

Report on the inspection of the Jackson Medical School, Jalpaiguri, dated the 1st December, 1935, was considered and adopted and it was decided that recognition of the school be continued for the year ending

April 1937, that admission of 25 students be continued as at present and that future action would depend on the report by the inspection committee after their inspection at the end of 1936 or at the beginning of 1937.

It was decided that Government order be awaited on the following matters:—

- (a) Sanction to the Provident Fund Rules of the office.
- (b) Amendment of the Bengal Medical Act, 1914.
- (c) Amendment of rules under the Bengal Medical Act, 1914.
- (d) Revision of the rules for the grant of leave to the Registrar.
- (e) Representation of the council and the Faculty on the Bengal Sanitary Board by a distinct member for each body.

The consideration of the revision of the appendix to the *Annual Medical List* was postponed and it was decided that copies of the *Ethical Suggestions* of the council and the proposed amendments be circulated to the Calcutta Medical Club, the Indian Medical Association and the Sub-Assistant Surgeons Association for remarks.

Report of the penal and ethical cases committee, dated the 18th July, 1935, was considered and it was decided that Dr. Bipinbihari Gupta be warned in respect of his advertisement in the lay papers.

In regard to the question of powers of the council to inspect examinations held by the State Medical Faculty of Bengal it was decided that the Advocate-General's opinion be awaited.

Government of Bengal Resolution no. 3296-P.H., dated the 18th December, 1935, announcing the appointments of Dr. Taraknath Majumdar, L.M.S., D.P.H., F.C.S., and Dr. Abdul Majid, M.B., D.T.M., D.P.H., as representatives of the Bengal Council of Medical Registration and State Medical Faculty of Bengal on the Bengal Sanitary Board, was recorded.

The Registrar's note regarding raising the preliminary standard of qualification for entrance to medical schools was considered and referred to a committee consisting of:—

- Dr. B. C. Ray, M.D., M.R.C.P., F.R.C.S.
Lieut.-Col. Sir Hassan Suhrawardy, Kt., M.D., D.P.H., F.R.C.S., I.T.F.

- Dr. J. C. Chatterjee, L.M.S.
Dr. K. S. Ray, M.A., B.Sc., M.B., Ch.B.
Dr. A. D. Mukherjee, L.M.F.

and they were requested to collaborate with a committee appointed by the Governing Body of the State Medical Faculty of Bengal for consideration of the same question.

Letter no. 25534/7-T-2-35, dated the 1st October, 1935, from the Surgeon-General with the Government intimating that steps are being taken for provision of separate teachers for teaching each subject in Government Medical Schools was recorded.

The undermentioned gentlemen were appointed members of the standing committee to inspect medical schools:—

- (1) Lieut.-Col. T. C. Boyd, F.R.C.S., D.P.H., I.M.S.
- (2) Dr. S. K. Mukherjee, D.O., D.O.M.S., F.R.C.S.
- (3) Dr. K. S. Ray, M.A., B.Sc., M.B., Ch.B.
- (4) Dr. Santiram Chatterjee, L.M.F.
- (5) Dr. A. D. Mukherjee, L.M.F.

The undermentioned gentlemen were appointed members of the penal and ethical cases committee:—

- (1) Lieut.-Col. T. C. Boyd, F.R.C.S., D.P.H., I.M.S., convener.
- (2) Lieut.-Col. Sir Hassan Suhrawardy, Kt., M.D., D.P.H., F.R.C.S., I.T.F.
- (3) Dr. B. C. Ray, M.D., M.R.C.P., F.R.C.S.
- (4) Dr. Panchanan Chatterjee, M.B., F.R.C.S.
- (5) Rai Sahib Dr. Prabodhchandra Ray, L.M.F.

Messrs. Lovelock and Lewes were appointed auditors to audit the accounts of the council for the year ending with the 31st March, 1936.

Report of the penal and ethical cases committee, dated the 19th December, 1935, was considered and adopted.

It was decided that the Dacca Medical School and the Lytton Medical School, Mymensingh, be inspected during the next six months.

It was decided that abstracts of proceedings of the council be supplied to the *Journal of the Indian Medical Association*.

The judgment of the Deputy Magistrate of Bogra sentencing one Sriskamal Sen Gupta to pay a fine of Rs. 250 or in default to undergo simple imprisonment for six months under Section 29 of the Bengal Medical Act, 1914, was recorded.

It was decided that the qualification D.T.M. (L'pool) be entered as an additional qualification against the name of Dr. Lal Mohan Ghosh, M.B., in the *Register of Registered Practitioners*.

A request from the Registrar, Bihar and Orissa Council of Medical Registration, for opinion on a proposed minimum standard of qualification for purposes of registration throughout India was referred to a committee.

INDIAN MEDICAL COUNCIL

LIEUTENANT-COLONEL G. VERGHESE, M.D., Ch.B., D.P.H. (St. And.), D.T.M. and D.T.H. (Liv.), I.M.S., Director of Health and Prison Services, Orissa, has been duly nominated by the Government of Orissa under clause (a) of sub-section (1) of section 3 of the Indian Medical Council Act, 1933 (XXVII of 1933), as a member of the Medical Council of India.

THE TINNEVELLY DISTRICT MEDICAL ASSOCIATION, PALAMCOTTAH

(AFFILIATED TO THE INDIAN MEDICAL ASSOCIATION)

Health exhibition
UNDER the auspices of the Tinnevely District Medical Association, in connection with its monthly meeting at Srivaikuntam, a health exhibition was arranged at the Coronation High School, Srivaikuntam, on Saturday 31st October, 1936, at 10 a.m., under the auspices of M. R. Ry. T. M. Kumarakuruparan Pillai, Avl., B.A., B.L., Vice-President, District Board, Tinnevely. Lieutenant-Colonel T. S. Shastri, I.M.S., the President of the Association, welcomed the guests, explained the cholera situation and requested Mr. Kumarakuruparan Pillai to open the exhibition.

M. R. Ry. Kumarakuruparan Pillai, Avl., in declaring the exhibition open said that such exhibitions are very useful, instructive and beneficial to the public and school children and promised to devote his best attention hereafter to encourage health propaganda. The local health inspector explained in Tamil the exhibited posters on the prevention and causation of cholera, tuberculosis, and flies, for the benefit of about 150 school children and public.

Monthly meeting
The Tinnevely District Medical Association held its monthly meeting on Saturday, 31st October, 1936, at Srivaikuntam, a holy place of the district. Members numbering 30 gathered from all parts of the district. The meeting began under the presidency of Lieutenant-Colonel T. S. Shastri, I.M.S. The Secretary read the minutes of the monthly meeting held at Sankarankoil on Sunday, 27th September, 1936, which were passed.

The following clinical cases were demonstrated and the case-notes read by Dr. P. S. Srinivasan, L.M.F.:—

1. A case of abscess of the back.
2. A case of kala-azar with parotitis as a complication.
3. A case of kala-azar with sloughing of tonsil, a rare complication.

He gave also a brief survey of the diagnosis and treatment of kala-azar. These were fully and keenly

discussed by the members which revealed Kayalpatnam as the home of kala-azar in this district, the Muslim women and children suffer most from it and the purdah system is largely responsible for the endemicity of it.

Lieutenant-Colonel T. S. Shastri, I.M.S., summed up the salient features of all the cases and brought the meeting to a close after proposing a vote of thanks to Dr. P. Ramalinga Nayanar for the excellent arrangements.

MEDICAL RESEARCH WORKERS' CONFERENCE

THE fourteenth Medical Research Workers' Conference is to be held in the library of the School of Tropical Medicine, Calcutta, from the 30th November to the 5th December, 1936, with Major-General Sir Cuthbert Sprawson, Director-General, Indian Medical Service, in the chair. Colonel A. J. H. Russell, I.M.S., Public Health Commissioner with the Government of India, will act as Secretary to the conference.

The Scientific Advisory Board of the Indian Research Fund Association will also meet at Calcutta at the same time.

The conference itself will be opened by the chairman with an address, and this will be followed by a general discussion in which the research workers present will each give details of research activities during the preceding year. Each item of research work will be discussed and the officer in charge of the work will make his proposals for the next year. The proposals will then be considered and recommendations made to the

Scientific Advisory Board whether and how far the suggestions for the following year be carried out.

In order to ensure that each item of research work receives close and adequate consideration, the conference will set up a number of advisory committees each dealing with problems appertaining to a particular subject. Thus there will be advisory committees on leprosy, cholera, maternity and child welfare, malaria, plague, nutrition and rabies. It has not yet been decided if there should be an advisory committee on tuberculosis, but if facilities of discussion so require, a committee will also be set up on that subject.

The recommendations of the conference will next be considered by the Scientific Advisory Board of the Indian Research Fund Association, which will meet for the purpose on the 5th December, before the workers assembled for the conference disperse, and the Board will in its turn make its recommendations to the to the Governing Body of the Indian Research Fund Association which meets in Delhi early in March next.

The conference will also discuss a series of resolutions dealing with the public health problems of India. These resolutions, too, will be considered by the Scientific Advisory Board of the Indian Research Fund Association, and passed on to its Governing Body with its recommendations. The Governing Body will again consider the matter, and such of the resolutions as they approve will next be forwarded to the Education, Health and Lands Department of the Government of India for its consideration.

It may be noted that as Major-General Sir Cuthbert Sprawson retires in February next, this will be the last Medical Research Workers' Conference over which he presides.

Current Topics

Arteriosclerosis: General Considerations

By G. EVANS, M.D., F.R.C.P.

(From the *Practitioner*, Vol. CXXXVI, June 1936, p. 679)

THE term arteriosclerosis was introduced by Lobstein in 1833 to describe a form of arterial disease which makes the vessel walls abnormally hard and brittle. The arteriosclerotic lesion is very varied in form. Its chief features are a thickening of the vessel walls due to cellular proliferation, the deposition of hyaline material, infiltration with various lipoids and calcification. In addition there is some degree of fibrosis, increase on occasion of elastic tissue and muscle fibres. The processes concerned in these changes are in part physiological and in part pathological. Thus in the involution of an artery such as occurs normally in the closure of the umbilical vessels and the ductus arteriosus there is a thickening of the intima due partly to cellular proliferation and partly to the deposition of hyaline material which leads to obliteration of the lumen. Again the changes which take place in arterial growth play a part in the arteriosclerotic changes which are found associated with persistent hypertension, namely, an increase in the thickness of the musculo-elastic layer of the larger arteries and hypertrophy of the media. *The pathological changes distinctive of arteriosclerosis are fatty infiltration and calcification.* Neither fatty infiltration nor calcification occur in growth, involution or hypertrophy. Further these changes are characteristically absent in syphilitic and tuberculous endarteritis, in the endarteritis of rheumatic carditis, in the chronic inflammatory changes found in arteries in the neighbourhood of chronic ulcers, such as peptic ulcers and the chronic ulcers of tabes dorsalis and syringomyelia, in the vascular changes found in new growths both benign and malignant (and Hodgkin's disease),

in periarteritis nodosa and in thrombo-angiitis obliterans. In syphilitic mesaortitis both fatty infiltration and calcification are found, but this lesion has, as distinctive features, endarteritis of the vasa vasorum, and small-celled infiltration and fibrosis of the middle coat of the aorta which make the differential diagnosis from aortic sclerosis clear.

It will be seen from this brief statement that the diagnosis of arteriosclerosis is only made after excluding such diseases as syphilitic and tuberculous endarteritis, after excluding changes due to local diseases such as chronic ulcers and new growths, and after excluding certain vascular lesions of distinctive form such as periarteritis nodosa and thrombo-angiitis obliterans. Lastly there are vascular lesions occurring in infancy, youth and adolescence which are best excluded from arteriosclerosis in spite of the fact that they are characterized by fatty infiltration and sometimes by calcification. It is uncertain, indeed unlikely, that they belong to the same series of pathological events as arteriosclerosis, both because of the early age at which they are found and because there is reason to believe that these structural changes are reversible. Of these lesions the fatty intimal streaks so often found in infancy and almost constantly from four years old and upwards have come in for most observation and discussion. There is general agreement as to the features of the actual lesion which is most often found in the valves on the left side of the heart and in the aorta. Its first appearance is in the form of a cholesterol deposit in the cells of a swollen intima. Some of these cells break down and their contained fat runs together to form small oval deposits of fat in the subendothelial layer. Other fat seems to be deposited free in the intima in its superficial layers and some in the musculo-elastic layer. There is no agreement, however, as to whether these fatty streaks are later absorbed or whether they ultimately develop into arteriosclerotic lesions, nor is there any uniformity of

opinion as to whether they are the result of infection or some ill-defined cause such as an excess of fat in the circulating blood, a mechanical factor or an inherent weakness in the vessel wall.

ÆTIOLOGY

Little is known for certain of the ætiology of arteriosclerosis. Some families are especially prone to the disease and a family history of cerebral thrombosis and heart disease is often obtained from an arteriosclerotic subject. In some families there is a liability to arteriosclerotic disease in a certain territory in the coronary arteries, for instance. Further the disease may even determine death at approximately the same age in so many members of a family, that the possibility of its being a matter of chance is most improbable. Age is the next most important factor. Arteriosclerosis is uncommon in young people unless associated with kidney disease. It is of common occurrence after the age of 45. The longer the life the greater is the opportunity for the causes of arteriosclerosis to operate. Evidence as to sex incidence is not sufficient to justify a definite statement. The part played by diet in the production of arteriosclerosis is also uncertain, at the same time both the effect of feeding experiments in animals and the association of arteriosclerosis with diabetes mellitus in humans suggest a connection between arteriosclerosis and disturbance of lipid metabolism. Further, persons who are over-weight are certainly more liable to arteriosclerosis, and in these cases a reduction of the caloric value of food intake is a beneficial therapeutic measure. Other evidence in support of a metabolic factor in the causation of arteriosclerosis is the association of gout and cholelithiasis with arterial disease. Both gout and osteoarthritis are clinically related to cardiovascular sclerosis.

The part played by infections whether acute or chronic is uncertain. Typhoid fever and other acute infections are well known to cause fatty infiltration of the longitudinal muscle fibres of the musculo-elastic layer of the intima, but it is not certain if this lesion develops into arteriosclerosis. Of other toxic agents lead is generally accepted as an ætiological factor. Alcohol and tobacco are probably of little importance. Of endocrine factors a deficiency of thyroid secretion (myxœdema) is generally held to predispose to arteriosclerosis, and the fact that pituitary basophilism and certain suprarenal tumours are accompanied by persistent hypertension make it probable that further research will establish a place for these glands in the ætiology of arteriosclerosis. The relation of Bright's disease to arteriosclerosis has already been referred to.

These few remarks on the ætiology of arteriosclerosis are necessarily brief. They are sufficient, however, to show that the causation of this disease is still wrapped in mystery. That this is so, in spite of the vast amount of work that has been done, is not surprising seeing that arteriosclerosis is in some ways on the border line between health and disease. It may be that it is caused by multiple factors which are only slightly pathogenic. If this were so such factors would be most difficult to recognize. It may be that a dystrophy inherent in particular arteries or affecting the whole vasculature of certain persons is the determining cause of arteriosclerosis.

TYPES OF ARTERIOSCLEROSIS

Arteriosclerosis, even excluding all the vascular lesions already referred to, remains so varied a pathological picture that for descriptive purposes it seems reasonable to make a distinction between several forms. The first of these forms is *nodular sclerosis*. It consists of circular or oval patches of intimal thickening occupying only a part of the circumference of the vessel, found chiefly in the arteries of larger size and occurring either alone or in association with the other forms of arteriosclerosis to be described. The actual lesions consist of a hyperplasia of the intima due to cellular proliferation and the deposition of hyaline material. Both

superficial and deep layers of the intima are involved. As the lesion progresses there is a deposition of cholesterol and calcification. At a later stage the centre undergoes necrosis and it is to this stage of nodular arteriosclerosis that the term *atheroma* is properly applied (the word *atheroma* being derived from the Greek word *αθηρη*, which means something like porridge). The overlying layers of intima may finally undergo necrosis and so lead to an atheromatous ulcer. There are no clinical symptoms of nodular sclerosis except in its final development when it may lead to a dissecting aneurysm or rupture of an artery. At some stage in the course of these intimal changes and indeed perhaps preceding and determining them there are local degenerative changes in the underlying media. The media undergoes degenerative changes in the form of fatty infiltration, calcareous deposition and atrophy of its muscle fibres with some degree of fibrosis and a minimum of cellular infiltration. As a result of these changes in the media the middle coat is rendered less elastic and is thinned. It has been suggested that the intimal thickening is initially a compensatory process to make good the local weakness of the media. In their early stages these lesions are pearly white or greyish spots a few millimetres in diameter. With the development of fatty infiltration they become yellow and when there is much calcification they are white or greyish-white and brittle. Nothing more is known of their causation than in the case of the fatty intimal streaks already described. Though similar in most respects to the fatty intimal streaks of youth and adolescence, nodular sclerosis is probably a distinctive lesion because of the presence of fibrosis and slight cellular infiltration from an early stage of its development, and because of the marked tendency to necrosis in nodular sclerosis, necrosis occurring even before fatty change and histologically demonstrable calcification have occurred.

The second form of arteriosclerosis is *senile arteriosclerosis*. In this form of sclerosis the lesion is as much (or more) in the media as in the intima. Degenerative lesions, namely fatty infiltration and calcification and fibrotic changes are the chief features of the lesion. There is less cellular proliferation and hyaline deposition than in nodular sclerosis. It also differs from the nodular form in being diffuse both in the circumference of the vessel, in the whole length of the vessel affected and in its widespread extent throughout the whole arterial system. Some parts, however, are more affected than others or practically escape. Senile sclerosis is generally most marked in the aorta and its largest branches. It may, however, develop to a considerable degree in the cerebral or coronary vessels and yet be of relatively slight degree in other parts of the body. Because there is advanced arteriosclerosis of this form in the brachial and radial arteries it does not follow that the coronary arteries are affected to anything like the same extent, and *vice versa*.

Age alone does not account for the pathological changes found in *senile arteriosclerosis*. Arteries undergo a gradual change throughout life. The early changes are those of growth and the changes in later life are reasonably attributed to age. The most important change due to age is a general distension due to deterioration of elastic tissue in the arterial walls. It involves also both circular and longitudinal muscles, and in consequence the vessels dilate and become tortuous. The change in the elastic tissue is not accompanied by fatty or calcareous degeneration. It leads to a loss of elasticity of the vessel wall and change in the pulse wave. At the same time as this change takes place in the elastic tissue there is an increase of fibrous tissue in the media and intima together with further splitting of the internal elastic lamina in those arteries which contain this structure in their walls. Lastly there is a gradually increasing deposition of finally divided calcareous material in the media. It will be noted from this description that *there is little fatty degeneration, no localized intimal thickenings or massive calcification such as is seen on*

occasion in so-called senile arteriosclerosis. Senile arteriosclerosis is a pathological state to the causation of which age no doubt contributes, but it is not due to senility.

The third form of arteriosclerosis is *Monckeberg's sclerosis*. This especially affects the arteries of the lower limbs. It is characterized by the massive deposition of calcareous material in the media and by relatively little change in the intima. This form of arteriosclerosis is probably determined in part by age, in part by mechanical factors which are responsible for its being commonest in the arteries of the lower limbs, but it is chiefly determined by general disease affecting the body as a whole. Thus, of the twelve pure cases described in Monckeberg's original paper, four died of cancer, four of tuberculosis, one of advanced heart disease and three of cachexia due to chronic infection.

The fourth form of arteriosclerosis was originally described by Gull and Sutton under the name of *arterio-capillary fibrosis*, and since then by Jores by the more appropriate term of *diffuse hyperplastic sclerosis*. It is sometimes referred to as arterial hypermyotrophy, but this word is a misnomer because it is not yet established that material hypertrophy of the media occurs except in the renal arteries and their branches. Even in these arteries the media may appear in some specimens to be actually thinner than normal. Diffuse hyperplastic sclerosis is characterized by diffuse intimal thickening due to proliferation of the endothelial and subendothelial cells of the intima with deposition of hyaline substance. There is an increase in the elastic tissue of the internal elastic lamina and probably an increase in the muscle mass of the media. The intimal thickening chiefly affects the terminal arterioles and their parent arteries. It is peripheral in its distribution in the arterial tree. This intimal thickening undergoes fatty degeneration in the terminal arterioles and there is complete occlusion of their lamina. As was first pointed out by Jores this fatty change stops short at the off-shoot of the arteriole from its parent vessel. There is little or no fatty change in the parent arteries. This pathological change is uniform in the circumference of an infected vessel, but it varies in its length, being thicker in some parts than others. It thus gives rise to a moniliform appearance in longitudinal section. Even when this arterial disease is well-marked some vessels are more affected than others and some escape. Its incidence in the several organs of the body is a characteristic feature. In its full development, as described above, it is most commonly found in the kidneys and spleen, less often in the pancreas and brain, it is relatively uncommon in the liver, stomach and intestines. It is not found in the arterioles of heart or skeletal muscles.

Diffuse hyperplastic sclerosis is the pathological lesion found post mortem in patients who have had hyperpiesia or chronic nephritis with persistent hypertension during life. It is found in both benign and malignant forms of hyperpiesia and is an especially marked lesion in the latter. Although arteriosclerosis is thus described in four forms, namely, nodular sclerosis (including atheroma), senile sclerosis, Monckeberg's sclerosis and diffuse hyperplastic sclerosis, there is no definite distinction that can be made between them. Just as there is uncertainty whether or not the fatty intimal streaks of infancy and adolescence are an earliest stage of arteriosclerosis, and as there is no dividing line between natural senile artery change and senile sclerosis, so there is no such thing as the occurrence of any one of the four forms of arteriosclerosis in pure form. Nodular sclerosis is a common accompaniment of diffuse hyperplastic sclerosis. Senile sclerosis in lesser or greater degree is generally found in all bodies after the age of 45 years. Monckeberg's sclerosis is probably never an isolated phenomenon, being always accompanied by nodular or senile sclerosis or both.

There are, nevertheless, many advantages to be gained by making these distinctions. In the first place it allows of a closer analysis of the vast subject included under the term arteriosclerosis. In the second place

certain etiological factors, as already pointed out, more closely connected with one form than another. At the same time all four forms of arteriosclerosis have this in common that they exhibit evidence in their very lesions or reaction to injury and a process of repair. Reaction to injury is especially evident in the cellular proliferation found in nodular and diffuse hyperplastic sclerosis. Fibrosis is common to all. Fatty infiltration and calcification are most marked in senile sclerosis. Calcification with, on occasion, little fatty change and little or no cellular proliferation is the characteristic of Monckeberg's sclerosis. A comparison of the pathology of the four forms suggests the importance of age in determining the type of lesion. Nodular and diffuse hyperplastic sclerosis develop in response to a pathogenic agent and at an age when there is vitality in arterial tissue to respond to the insult. Senile sclerosis develops in a later age period, and in the absence of adequate power to respond to the insult arterial tissue undergoes fatty and calcareous degeneration. In Monckeberg's sclerosis two additional factors come into action, namely, mortal illness and the effect of gravity. Monckeberg's sclerosis has been described as something more senile than senile sclerosis.

PATHOLOGICAL AND CLINICAL FINDINGS

When the correlation of arteriosclerosis with clinical phenomena is considered there arises the difficulty that the arteriosclerotic lesion is largely the result of recovery from or at least successful reaction to the disease responsible for it. Thus the senile form of arteriosclerosis may be diagnosed by the hardness and tortuous course of the superficial arteries. Its presence in the ascending aorta may be recognized by an alteration in the second aortic sound. Arteriosclerosis may be seen in the uneven calibre of retinal arteries and in the change of form at arterio-venous crossings. Arteriosclerosis may be found in the renal vasculature when a trace of albumin is found in otherwise normal urine in a subject who bears other evidence of arteriosclerosis. X-ray evidence may place the diagnosis of Monckeberg's sclerosis beyond doubt. Persistent hypertension with a diastolic pressure above 90 mm. Hg. and systolic pressure above 190 mm. Hg. with the patient at rest may lead to the diagnosis of diffuse hyperplastic sclerosis as a matter almost beyond doubt. And yet to establish the fact of arteriosclerosis does not establish the fact that the patient is suffering from it. Rather the reverse in fact, for the presence of arteriosclerosis is in itself evidence that the patient is putting up a good resistance to the disease or has recovered from it. Once this point is fully appreciated it is readily understood why some persons with thickened and tortuous arteries are so well and suffer nothing from their supposed disease, and why some persons with benign hyperpiesia live for years in good health in spite of their persistent hypertension. To make this point clear, though it may be over-emphasis, arteriosclerosis is to an extent comparable to fibrosis and calcification in pulmonary phthisis. Now active phthisis is known by certain symptoms and signs, by malaise and fatigability, by fever and loss of weight, by dyspepsia and tachycardia, and by cough and sputum. Are there signs and symptoms of arteriosclerotic disease by which it can be recognized before it reaches the advanced stage of recovery and repair known to pathologists as arteriosclerosis?

CLINICAL PICTURE

The clinical picture of arteriosclerotic disease can best be sketched by beginning at the end and working backwards. Thus in the first place there are complications of and sequelæ to the changes in structure of the arteriosclerotic vessels. These give rise to well-known clinical syndromes according to the location of maximum disease. In the case of the lower extremities, gangrene, intermittent claudication, muscular weakness and paraesthesiae are looked for. In the portal area mesenteric thrombosis and perhaps acute hæmorrhagic pancreatitis and diabetes mellitus may be due to

angina pectoris and auricular fibrillation are common complications of coronary sclerosis. In the brain cerebral thrombosis and hæmorrhage and various forms of psychosis and dementia may be due to arteriosclerosis of the cerebral arteries. In the second place disease of the heart or kidneys is often associated with arteriosclerosis. When the heart is coincidentally affected it will be larger in size and present other evidence of organic disease out of proportion to the presumed arterial disease, thus determining the diagnosis of cardiovascular sclerosis. Chronic nephritis may be the dominating feature of the clinical picture and arteriosclerosis a seemingly secondary event. Or the renal and vascular disease may so balance as to make the diagnosis of chronic interstitial nephritis. In other words the diagnosis of arteriosclerosis may be indicated by evidence of chronic organic disease in any part of the cardiovascular renal system.

A diagnosis of arteriosclerotic disease, as distinct from arteriosclerosis, on such a basis as this is not sufficient. The thrombosis in an arteriosclerotic vessel which determines gangrene of a part may be due to a complicating condition or disease, such as debility, infection or trauma, and not due to activity of arteriosclerotic disease itself.

Arteriosclerotic disease itself can be visualized as a sub-acute or chronic process with phases of activity and phases of quiescence. It is the clinical picture of its active phase or phases that must be recognized before it can be said that a patient is suffering from arteriosclerotic disease. This clinical picture is as yet hardly known. In the future asthenia, fatigability and a slight pyrexia may be found among its symptoms. For the present a close enquiry as to hæmorrhage and pain should be made. Bleeding may be from any organ but is rarely in the skin. Epistaxis is common. Retinal hæmorrhages (or hæmorrhage into the vitreous) and microscopic (or macroscopic) hæmaturia are often found. Uterine hæmorrhage and hæmorrhage into the stomach (with hæmatemesis), the bowel (mælena) or lung (hæmoptysis) are other sites of hæmorrhage often met with. The brain is another common site of hæmorrhage, but cerebral hæmorrhage due to vascular disease may be due to the rupture of a miliary aneurysm which has not resulted from arteriosclerotic disease.

Pain is of varied kinds. It may be severe and filled with foreboding as in the pain of angina pectoris. It may be severe headache that raises other difficult differential diagnosis. Or it may be simply a vague rheumatic pain which is lightly passed by in terms of neuralgia or fibrositis.

It might be expected that post-mortem examination would supply a ready answer to the interpretation of vascular pain, but as a matter of fact there is often no close correspondence between the clinical picture and the post-mortem findings. In the case of coronary sclerosis, for example, Aschoff has remarked that even the most advanced cases of coronary sclerosis may run their course without any clinical phenomena whatever, and that the clinical aspects of coronary sclerosis may bear little relation to the anatomical findings. This statement might equally be made in regard to vascular phenomena related to arteriosclerosis in other parts of the body. The lack of correspondence between functional disturbance and structural change has been explained in terms of arterial spasm. It is believed that diseased arteries are more prone to spasm than healthy arteries and that localized arterial spasm accounts for instance for the transient pareses, sometimes amounting to a monoparesis or hemiparesis, often found in arteriosclerotic subjects. The same subject comes up for discussion in the differential diagnosis of coronary spasm and coronary occlusion, in the case of muscular cramps in the extremities, paroxysmal headache of certain kinds and abdominal colicky pain. On the whole clinical opinion is increasingly in favour of arterial spasm as a complication of arteriosclerosis, but it may be that some of the symptoms at present

explained in terms of spasm will later be included in the clinical picture of the active phase of arteriosclerotic disease.

TREATMENT

Though there are no means available of controlling arteriosclerotic disease, and though we have no remedy which directly promotes the healing and repair of diseased arteries, nevertheless good results may be obtained by treatment on general lines, especially by improving the patient's health and strength. The patient's life should be so regulated that he lives within the limits of his strength. The day's work is reduced. Emotional stress is lightened in every possible way. This means shorter hours of work, longer holidays, change of environment or companionship, and education in a philosophic attitude towards life. The patient is generally advised to continue his work, and irksome restrictions are avoided. Extra rest, best spent horizontal, is advised. Regulated exercise is good for the circulation. A body that is over-weight should be reduced by restriction of food intake, regulated exercise and massage. A body that is under-nourished may need feeding up. All bodily functions should be restored to as near normal working as possible, and so we try to obtain for the patient peaceful sleep at night and a mind at rest: a good digestion, and the evacuation of soft-formed stools with a sense of completion. The activity of the skin is improved by a daily warm bath, or perhaps a Turkish bath once a week. Elimination by the kidneys is promoted by bland drinks, including barley water and fresh weak tea. Liver function is improved by an occasional or regular small dose of mercury followed by salt in the morning, and bowel function by a compound rhubarb pill or other mild laxative. Alcohol is forbidden or allowed in strict moderation. Some patients are improved by a vegetarian diet; others are better with a limited animal protein intake. On the other hand, when there is gastric dyspepsia, carbohydrate food rather than protein may require restriction. Milk and milky foods have no advantage if other foods are well digested. Symptomatic treatment is indicated for the control of headache, restlessness and irritability, palpitations, cough, rheumatism and the like. Obvious focal sepsis should be dealt with, and with great care when the disease is far advanced. Complications of arteriosclerosis such as failure of circulation in the limbs or threatened gangrene cardiac embarrassment or failure, offer a wide field for treatment. Other treatment may be indicated by the presence of associated or complicating diseases, such as osteo-arthritis or gout, chronic bronchitis and emphysema, diabetes mellitus, obesity, and heart and kidney disease. Thyroid gland by mouth does good in some cases. Iodine is especially indicated if there is a suspicion of syphilis. In general terms the most useful drugs, in addition to those already mentioned, are sodium bromide or luminal, sodium bicarbonate, diuretin and digitalis.

The Therapy of Typhoid Fever

By O. W. BETHEA, M.D.

(Abstracted from the *International Medical Digest*, Vol. XXVIII, April 1936, p. 245)

WARD SUGGESTIONS FOR THE TREATMENT OF TYPHOID FEVER

Absolute rest in bed.

An ice bag to the head if the temperature is over 102°F. (38.9°C.).

A daily cleansing sponge bath.

Sponge baths for temperature over 103°F. (39.4°C.).

Alcohol rubs and dusting powder to contact surfaces only.

Careful attention to oral hygiene.

From half to one fluid ounce of liquid petrolatum each night.

Half fluid ounce of castor oil, if other laxative is needed.

Enemas and colon tube as indicated for distension.

Quarter grain codeine, if needed for pain.

No aspirin or other antipyretics. No morphine unless evidence of hæmorrhage or perforation.

If evidence of hæmorrhage or perforation, notify a house physician at once. Discontinue intake by mouth. Apply an ice bag to abdomen and administer morphine by hypodermic.

If a diarrhoea develops that is not relieved by dietetic changes, try 30-grain doses of bismuth subgallate.

Four to eight pints of liquids each 24 hours.

Diet: About 2,000 to 3,000 calories daily. Three meals and three interval feedings. Select from the following list:—

Tea or coffee with cream and milk sugar.

Fruit juices with milk sugar (avoid excess of orange juice).

Strained soups or broths made with half milk and rice or barley.

Gelatine or jello with cream; boiled custard; soft-boiled eggs.

Butter milk, butter, cream cheese (with cream).

Soft cooked grits, mush, cream of wheat and Ralston's with butter, or cream and sugar, or with meat juice.

Mashed potatoes, puréed carrots, beans or peas.

Toast (free from crust).

A sample diet, with caloric values, is indicated in the following suggestions:—

Breakfast:

1 soft-boiled egg	..	75	calories
2 heaping tablespoonfuls of soft cooked cereal	..	100	"
1 slice of toast	..	75	"
$\frac{1}{2}$ ounce of butter	..	50	"
1 cup of coffee or tea (with cream and milk sugar)	..	100	"
TOTAL	..	400	calories

10-00 a.m.:

1 cup custard	..	200	calories
TOTAL	..	200	calories

Lunch:

6 ounces of cream soup (with barley)	..	150	calories
1 slice of toast	..	75	"
1 heaping tablespoonful of soft cooked cereal	..	50	"
$\frac{1}{2}$ ounce of butter	..	50	"
2 heaping tablespoonfuls of mashed potatoes or carrots (with milk and butter)	..	100	"
TOTAL	..	425	calories

3-00 p.m.:

1 cup custard, or gelatin with cream and a toasted cracker	200	calories
TOTAL	..	200 calories

Dinner:

Cream soup or broth (with barley or rice)	..	150	calories
1 heaping tablespoonful of soft cooked cereal with meat juice or butter	..	50	"
1 slice of toast	..	75	"
$\frac{1}{2}$ ounce of butter	..	50	"
Gelatine with cream	..	100	"
TOTAL	..	425	calories

9-30 p.m.:

Malted milk (with water)	..	75	calories
Toast with butter	..	100	"
TOTAL	..	175	calories

To this is added the fruit juices sweetened with milk sugar that are taken throughout the 24 hours:

Fruit juices with milk sugar (avoid excess of orange juice) 500 calories

TOTAL .. 500 calories

GRAND TOTAL .. 2,325 calories

Under the circumstances, *i.e.*, the condition in which the patients arrived in hospital, I feel that our results were fairly satisfactory. One patient had a perforation the day that the group was formed and before treatment had been started; he died within 48 hours. One reached us in extremis after massive hæmorrhage of three days' duration; he survived only a few days. One patient was in the fourth week of the disease and the autopsy showed that in addition to typhoid fever, he was also suffering from advanced, bilateral pulmonary tuberculosis, with extensive cavitation. The other 18 lived. Of these, one had perforation and was promptly operated upon; two had thrombophlebitis and several had moderate intestinal hæmorrhages. There were some additional complications such as epistaxis, furunculosis, etc., but the progress as a whole was excellent. Nutrition was well maintained, delirium was rare and any marked discomfort was the exception.

In further elaboration of this plan let me call attention to the following:

No effort was made to give the Brand baths. Each patient had a daily warm sponge bath. Alcohol rubs were not used except to the contact surfaces such as the back, elbows, etc., where they were employed for hardening the skin and lessening perspiration. If alcohol rubs have this effect, they would certainly be undesirable treatment for the rest of the skin surface, as they would lessen the valuable function of that structure. We did not hesitate to use a mild laxative when indicated. I believe that the danger of producing hæmorrhage or perforation by mildly promoting peristalsis is less than the danger from fæcal or even gaseous accumulation.

Codeine met all of our requirements for sedative purposes, most patients not needing any analgesic or sedative treatment. No acetylsalicylic acid or other antipyretics were given. This rule was rigidly enforced as I have a very strong conviction that aspirin is particularly dangerous in such a condition.

In our first case of perforation which occurred before treatment had been instigated, there was a delay on the part of the nurse in notifying the intern and further delay in the intern's notifying the house surgeon. As part of our plan of treatment we had definite arrangements looking toward such an emergency, so when the next case developed, the patient was on the operating table in less than an hour and made an uneventful recovery.

With the diet as here given, no diarrhoea of even moderate variety developed; in fact, the food disturbances were minimal. In one well-known system of medicine of comparative recent years, diets were recommended with a value as high as 5,600 calories. There is also a tendency at present to give almost any food that a patient will take. I cannot get over the impression that these patients have a definitely diseased alimentary tract and therefore that certain restrictions are essentially indicated. Not only that, but we have found it so easy to give these individuals a varied, palatable and sufficiently nutritious diet and yet confine the intake to material that will present the least possible element of danger. Here, as in many other hospital diets, we found it necessary to restrict orange juice, as it is so cheap, so palatable, so easily prepared and administered by the nurse, that there is a definite tendency to overuse it with resulting abdominal distension.

Upon the request of some of our confrères we tried two special treatments. Three patients were given methenamine (urotropine) intravenously for five days. No influence on their progress could be noted. Three patients were given emetine hydrochloride for the same period of time with the same results.

Technique of Spleen Puncture

By L. EVERARD NAPIER, M.R.C.P. (Lond.)

(From the *Lancet*, Vol. II, 18th July, 1936, p. 126)

PUNCTURE of the spleen through the abdominal wall with a hypodermic needle in order to obtain a sample of blood from that organ, for diagnostic or other purposes, is a procedure not generally favoured by medical authorities. The value of the information obtained is not considered commensurate with the dangers of the operation.

As a rapid and certain method of diagnosis in kala-azar spleen puncture is unrivalled; it is the method by which the accuracy of all other diagnostic methods used in this disease are finally judged.

In the investigation of the pathological processes in blood and other diseases in which splenic enlargement is a prominent symptom, the possibilities of spleen puncture have not been fully explored. By means of sternum puncture some information as to the state of the blood-forming organs can be obtained; by examination of the peripheral blood the state of the blood as a working unit in the organism can be judged; and it seems certain that useful information regarding the processes of blood-cell destruction might be obtained from the blood taken directly from the sinusoidal spaces in the spleen.

It is not proposed here to discuss further the possibilities of spleen puncture as a diagnostic method in other parasitic or bacterial diseases, or as a means of investigating the ætiology of blood diseases, nor to make any reference to my previous observations in this connection, but rather to describe the technique that I have adopted during fifteen years' continuous experience of the operation, and to discuss the risks of the method.

Reference to spleen puncture are few and usually consist of a bare mention of the method as being employed, but as not being free from risk; other writers go further and suggest that it is an unjustifiable procedure. Whilst all emphasize its dangers, none suggest that these dangers may be obviated or even mitigated in any way by the adoption of a standardized technique—beyond an occasional warning that the strictest asepsis should be observed; but, as the operation necessitates passage of the needle through the peritoneal cavity, this precaution is so fundamental that reference to it might almost be omitted—yet, in discussing the risk of any operative procedure, the greatest emphasis is usually laid on the technique. Writers presumably adopt the attitude either that the procedure is so simple that any one can work out his own technique—if such a grandiose word is applicable—or that there is no right way of doing something that is fundamentally wrong.

Books on clinical methods often fail to mention spleen puncture and books on tropical medicine are seldom any more explicit than those on general medicine. Stitt suggests that the operation is dangerous, and refers to the death rate following it as approximately 1 per cent. Manson-Bahr and Rogers and Megaw both give some details of the technique, but with those given by the former I am not in entire agreement, and the latter's description is very brief.

PERSONAL EXPERIENCE

In a period of a little over 15 years I have done spleen puncture well over 5,000 times. Although accurate records of all these have not been kept, the claim is not an irresponsible one. During practically the whole of this period I have been in charge of the kala-azar cases, both hospital and outdoor, at the Calcutta School of Tropical Medicine. The number

of kala-azar patients treated in the hospital during those years that I was in charge of the department was 2,230, and the number in the outpatient department 7,387 (see annual reports of the School). Spleen puncture has been done on 90 per cent of the inpatients, at least once during their stay in hospital; during the first half of the period it was done as a routine procedure on admission and again before discharge, and in some cases at frequent intervals during the course of treatment. It has also been done in probably an equally large number of cases that simulated kala-azar clinically; these of course are not included in the above figure. In the outpatient department spleen puncture was done as a routine measure in the early days before the introduction of the aldehyde test, and for some time after its introduction, in order to test its accuracy; for example, a series of 239 cases in which both the spleen puncture and aldehyde test were done, during a period of eight months, was reported by me in 1923. More recently, it has only been done in doubtful cases. I have only on very rare occasions deputed this work to an assistant.

More than half these spleen punctures have been done in patients who have subsequently been under observation for some days at least. In not a single case has any patient who has remained under observation suffered any ill-effects, beyond slight tenderness over the splenic area; nor have we received any reports of deaths or serious sequelæ that could be attributed to the operation in those that went to their homes shortly after the operation. In about 1 per cent of the cases there has been marked tenderness lasting a few days, suggesting, when the site of the pain seemed to be deep in the spleen, that there had been a hæmatoma in the spleen substance or under the capsule, or that there had been a little oozing from the puncture in the capsule with the formation of a clot between the two peritoneal surfaces. We have not been able to demonstrate either of these processes in the post-mortem room, but in one case where death occurred suddenly about 24 hours after spleen puncture (sudden death is not a very rare occurrence in kala-azar), we were able to do a limited post-mortem examination and obtained an intact spleen but found about a pint of slightly blood-stained fluid in the peritoneal cavity; there had evidently been a little oozing in this case, but the fluid was mainly ascitic.

Though I have had no fatalities attributable to this operation in my own cases, I have seen death follow a spleen puncture in which the operator kept the needle in the spleen for half a minute or more and repeatedly withdrew the plunger until his syringe was almost full.

TECHNIQUE

I standardized my technique early in my experience and have not found it necessary to modify it subsequently. It was probably adopted from my senior colleagues, especially Dr. E. Muir and Colonel F. P. Mackie; the only serious claim to originality that I can make is the introduction of the special spleen-puncture syringe described below. There are certain details in the procedure such as the giving of calcium lactate with the avowed object of increasing the coagulability of the blood, that might be omitted, others which though they may sound trivial, I think are of importance, but in view of my continued success with the operation and of the reported ill-success of others I felt that it was better to adhere rigidly to my original procedure.

Preparation and after-treatment.—This has necessarily to be modified in the case of outpatients. For hospital patients we give grs. 30 of calcium lactate the night before; we repeat the dose in the morning and give a third dose immediately after the puncture. The patient is kept in bed for the whole day; he is given a cup of tea at 6 a.m. but no food subsequently until an hour after the operation; this is usually done between 10 and 11 a.m. Outpatients are given a dose of calcium lactate immediately spleen puncture is decided upon and are usually kept until 1 p.m. to

ensure that they have had no food for some hours; they are then given a second dose after the spleen puncture, and made to lie still for an hour or more until the slide has been examined; they are then seen, and if there is no contra-indication they are allowed to go home.

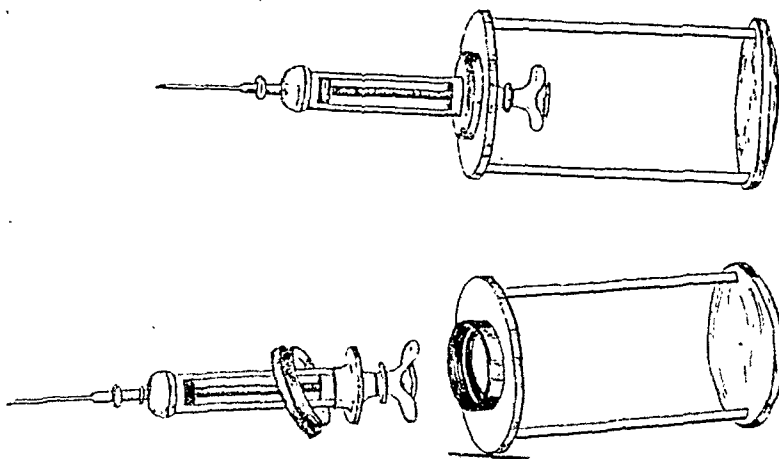
The splenic area is cleaned up with some suitable antiseptic and a binder is placed in position under the patient's back and is bound tightly round the abdomen after the operation. The patient lies flat on the bed, with the pillows removed and his hands placed under his head; the operator sits on the bed on the left of the patient, facing him. An assistant is unnecessary, but a nurse should stand at the head of the bed ready to intercept the patient's hands should he move them; it is better not to hold his hands as the procedure may alarm him.

The syringe and needle.—I have used my own spleen puncture syringe for about 14 years now and would hesitate to undertake a spleen puncture without it. The feature of the syringe is that it can be operated with one hand; this leaves the other hand free to locate and to fix the spleen, whereas normally one hand is required to hold the syringe and the other to withdraw the plunger. It is not just a matter of saving an assistant, because in the case of a spleen that just reaches below the costal margin only the operator can locate it sufficiently exactly to allow a puncture to be done safely. In this way the spleen of a wriggling child can be gripped and fixed, and the child allowed

should be allowed to cool, but not get cold, and great care should be taken that the plunger is running easily.

The operation.—The point chosen is half an inch below the costal margin on the long axis of the outer (parietal) surface of the spleen. If the spleen is small it may be necessary to go even closer to the costal margin, but it is as well to give as much space as possible as very acute pain is caused if a rib is scratched by the needle. On the other hand, if the spleen is very large, it is unnecessary to go so near to the ribs. The object of choosing this point is to ensure puncturing at the thickest part of the spleen. I never puncture the spleen unless it is palpable below the costal margin. When the exact spot has been selected it should be touched with a match that has been dipped into pure carbolic acid. This serves a fourfold object; it marks the spot so that the operator can take his eye off it and see that his syringe is working properly, or even move away and sterilize it; it has a slight anæsthetic effect; it is antiseptic; and, finally, it leaves a permanent tell-tale mark that has on a number of occasions saved a second spleen puncture in a patient who has come up again as a new case. We do not use carbolic for young children as the burning sensation frightens them. Immediately before the puncture the spot is swabbed with spirit to remove any excess of carbolic that might get on to the needle and thence into the culture medium.

The operator, sitting on the left side of the patient, puts his left hand below the spleen, if it is a large one,



to rotate around it, so to speak, while the operation is being performed.

The syringe is illustrated in the figure. It has a long handle, or grip, attached to the barrel of the syringe; this lies in the palm of the hand, whilst the first and second fingers are passed under the top of the plunger and withdraw it; if necessary (it should not be), the plunger can be pressed in again with the thumb. I use an ordinary 5 c.cm. Roux syringe to which the special handle is easily attached by means of a collar that screws into the handle and holds the flange of the barrel of the syringe firmly. An all-glass syringe can also be used, but this particular fitting will not take a Record syringe. The needle should be moderately stout and about 1½ inches in length—a no. 11 is the one usually used. It must be sharp and bright.

If an all-glass syringe is used it may be dry-sterilized, but a Roux syringe is, on the whole, more satisfactory, and is best sterilized by drawing hot vaseline (160°C.) in and out of it two or three times. All the vaseline should be squirted out, otherwise it may block the needle or mix with the blood when this is expelled on to the slide; this is not a serious complication for an ordinary blood smear but it is liable to spoil a supravital stained preparation. The syringe

to prevent any downward movement, or, if it is of moderate size, he places his hand on the abdomen so that the protruding triangular portion of the spleen fits into the angle between his first finger and thumb, in this way the spleen is immobilized and exactly located.

The puncture is done in two movements. By the first only the skin is punctured; this is done by holding the needle at a very acute angle, almost parallel with the skin surface. If the skin is tough it may be difficult to control the extent to which the needle goes in, but if the angle is sufficiently acute the point of the needle will not penetrate beyond the subcutaneous tissue.

The skin puncture may be done in any direction that is convenient; the needle is then withdrawn until only about an eighth of an inch is still through the skin, and then the syringe is rotated into position for the second stage of the puncture. Here the direction of the puncture is very important; the needle should form an angle of about 45° with the skin surface, and should point upwards and slightly outwards along the line of the long axis of the spleen. The needle is then plunged through the soft tissues of the abdominal wall and into the spleen substance. Perfect control over the needle is possible at this stage as only soft tissues are being punctured; the depth to which the needle is

pushed in will depend on the thickness of the abdominal wall, but the object should be to penetrate the spleen substance for about half an inch; the plunger should be withdrawn and released three or four times very rapidly and the needle immediately withdrawn altogether. If the plunger is running easily and is air-tight (this can be tested beforehand by thrusting the point of the needle into a rubber cork) the plunger will immediately spring back into its original position directly it is released—unless of course the syringe fills with blood, as happens occasionally—and the three or four withdrawals of the plunger should be done within a fraction of a second. It is important that the plunger should be released before the syringe is withdrawn finally, as, if this is not done, when the drop of blood in the needle comes under the influence of atmospheric pressure, it will be driven into the body of the syringe and may be recovered only with difficulty.

It is quite unnecessary, in fact dangerous, to continue to withdraw the plunger until blood appears in the barrel of the syringe. Only a small drop of blood is necessary, and this will always be found in the needle if the plunger is withdrawn rapidly once or twice. This should be squirted out on to a slide, without touching the slide with the point of the needle; the needle and syringe can then be washed out with a small quantity of sterile saline and the washings used for cultural purposes, if it is thought necessary.

In my opinion the safety of the operation depends on the angle at which the needle is pushed into the spleen and the rapidity of that part of the procedure while the needle is actually in the spleen substance. The angle and the direction are chosen in the first place to ensure that the needle point remains in the spleen substance; if the needle passes through a thin portion of the spleen two punctures are made in the capsule instead of one, the needle may penetrate some other organ or vessel, and little result will be obtained from the puncture; in the second place, because the downward movement of the spleen is controlled by the left hand and any movement that occurs must be upwards—i.e., away from the needle—so that the only result would be that the needle was withdrawn slightly, whereas if it were piercing the spleen at right angles to the surface any movement would be against the needle and might lead to the tearing of the capsule and the spleen tissue.

The patient is not told to hold his breath, but the needle is plunged in at the end of an inspiration; there is a natural tendency on the part of the patient to hold his breath, but in any case he can only expire and the needle should be withdrawn long before he has time to take another breath. Patients are not all very intelligent, and if you once interfere with their normal breathing they are liable to do many unexpected things. The first stage of the puncture can be done slowly and deliberately; it is only the second stage that should be done rapidly, and it is here that experience is of value.

The *spleen puncture material* is blood from a large venous sinus, from a small sinus, or from the sinusoidal spaces. There may also be tissue cells that normally are fixed, but which have been dislodged by the passage of the needle through the spleen tissue. Whatever blood is obtained, it differs from peripheral blood, and even in cases where the syringe fills immediately from a large sinus, there are always more white cells, mostly of the endothelial type, and in cases of kala-azar parasites are usually easy to find (contrary to statements in the textbooks).

It is not at all clear what is meant exactly by the expression 'spleen pulp' (I admit that I have used it myself in the past). Some writers emphasize the necessity of obtaining this pulp, and one has described an elaborate procedure with electric torches and dark rooms to see whether he has obtained the requisite amount of pulp. If he has not, presumably he goes back and does another spleen puncture.

I was at one time under the impression that now and then there were some solid particles in the blood

expressed from the syringe and, from the fact that there did not appear to be any solid tissue in the stained films, I assumed that this substance was broken up during the process of making a smear. However, some years ago I stained by a supravital process a number of specimens obtained by spleen puncture and found that in every case the film under the coverslip spread as evenly as any drop of blood. Since then I have been on the look-out for these granules of pulp that are described but have not seen them. It is of course possible that if you rake about in the spleen, as some operators do, you may dislodge some solid pieces of spleen parenchyma, but it is neither necessary nor desirable to remove macroscopic portions of the spleen.

I have seen these granules simulated by blood that has clotted in the needle, by coagulated blood from a trace of alcohol left in the needle, and by a particle of solid paraffin when it has been used for sterilizing the syringe.

In investigating blood diseases the spleen-puncture findings have to be accepted with reserve, as much depends on the exact portion of spleen substance that the needle happens to strike. If the point penetrates into a Malpighian corpuscle nearly all the cells will be lymphocytes, whereas another puncture in the same spleen may show practically no lymphocytes. Quite frequently we have found large numbers of megaloblasts and erythroblasts in cases in which there were few in the peripheral blood; this suggests an extramedullary erythropoietic focus; however, a failure to find this in another patient does not mean that the same state of affairs does not exist, but only that the needle has not happened to reach one of these areas.

PRECAUTIONS AND CONTRA-INDICATIONS

It is worth while investigating the coagulation time and examining the blood smear to exclude myelogenous leukaemia and other conditions in which the coagulation time is much delayed. I did not do this as a routine procedure. On three occasions in the outpatient department I have done spleen puncture in cases of myelogenous leukaemia in which blood films had not been previously examined, without any adverse symptoms following, but in deference to the strong opinion against the operation in these cases, I have not done it when the diagnosis was clear.

Jaundice, ascites, and bronchitis are given in textbooks as contra-indications, but I have not hesitated to do spleen puncture in these cases; ascites certainly adds very much to the difficulty of doing the operation, and it may be advisable to perform paracentesis first. The main difficulty is that the ascitic fluid is liable to get into the syringe and dilute the blood. With reference to bronchitis, if the operation is done rapidly the patient has no time to cough. Manson-Bahr advises a local anaesthetic, but there is nothing beyond a psychological effect to be gained by this; a general anaesthetic is of course unnecessary; I have never used either.

DISCUSSION

I have been encouraged to put these notes together because I feel that spleen puncture is quite wrongly considered to be a dangerous procedure. Though my experience may not perhaps have been unique, it has at least been unusually extensive, and I am driven to the conclusion either that spleen puncture is a safe operation or that the technique I use has some special features to commend it. The simplest operation is dangerous if executed in a reckless manner. The dangers of spleen puncture are by no means negligible, and I am in full agreement with those who say that it should not be undertaken lightly; every detail should be considered and the operator should give his full attention to his task; in fact, simple though it is, he should tackle it in the spirit in which he would a major operation.

SUMMARY

The value of spleen puncture as a diagnostic method in kala-azar is well recognized. The value of the

method in the investigation of blood diseases with splenomegaly has not yet been fully explored.

I have performed spleen puncture more than 5,000 times and have observed no ill-effects following the operation. A feature of my method is a special syringe attachment designed for this operation.

The Chicago Outbreak of Amœbic Dysentery in 1933

(From *Public Health Reports*, Vol. 51, 26th June, 1936; p. 845)

An epidemic of amœbic dysentery had its origin in Chicago during the summer and fall of 1933. This was the first recognized water-borne outbreak, and the only known extensive epidemic of this disease in a civilian population.

During the period of the epidemic there were approximately 8,500,000 out-of-town visitors to Chicago, with resulting unusual congestion of downtown hotels and public eating places. Chiefly involved in the epidemic were two neighbouring large downtown hotels. They had in part a common water supply. Incomplete reporting brought to light a total of 1,409 cases, of which more than two-thirds were in out-of-town visitors.

Only one focus was discovered which accounted for any considerable number of cases; namely, the two hotels. The infection was spread within the hotels from about 1st June to 31st December, 1933, with a particularly high incidence late in June, during the latter half of August and early in October. The incidence of carriers was high among employees of the two hotels.

The two major points of possible pollution which are considered to have resulted in water-borne infections in the hotels were as follows: (a) Two cross-connections in hotel X which joined an overhead sewer to condenser-water discharge pipes. This water, which had been first used for cooling purposes, was distributed throughout hotel X and to the upper floors of hotel Z. The pollution of this water would account for the observed parallelism of the incidence of infection in the two hotels. (b) An old, rotting, wooden plug in an overhead sewer which permitted leakage into the cooled drinking-water tank below. This would account for infections among guests and patrons only in hotel X, because this water system was limited to that hotel.

Efforts were made to control the outbreak by the elimination of carriers of cysts of *E. histolytica* from among the food-handling staffs, but there is no evidence that these efforts were successful.

The measures required to prevent the recurrence of such an epidemic are the following: (a) Effective supervision of the installation of plumbing in new buildings and of changes in old ones; (b) reasonably frequent inspections of the water and sewage systems of buildings, especially of the older ones; (c) particular attention to the elimination of hazardous cross-connections, through preventing their installation and through detecting and removing existing ones.

Institutions serving the public, particularly those providing residence, meals, or beverages, should be encouraged, aided, and required to provide adequately for the protection of the public health. Properly trained sanitarians should more commonly be included in the personnel of such organizations.

Sterile Mating

By V. B. GREEN-ARMYTAGE, M.D. (Brist.),
F.R.C.P. (Lond.), F.C.O.G.

[Address delivered at the British Postgraduate Medical College, Hammersmith, on 18th May, 1936; reprinted from the *Lancet*, Vol. II, 22nd August, 1936, p. 426]

From the days of Genesis sterility has been regarded as one of the four major curses of life, but since primary sterility is usually due to the summation of

four or five causative factors in both parties, sterile mating is a better title.

It is not my intention to discuss the forty-odd causes of sterility, nor to deal with displacements of the uterus and conservative operations upon the ovary, but rather to indicate how modern investigations may assist diagnosis, prognosis, and treatment. Before doing so, I may remark that the modern *Homo sapiens* is a relatively infertile animal. For in crowded England 10 per cent of all marriages fail to produce conception; while 15 per cent of pregnancies terminate in miscarriage. In 30 per cent of cases the fault of non-conception lies in the male partner, and the time has gone by when the only treatment considered for sterility was 'opening the womb'.

The following are necessary in every case of sterile mating: (1) a complete medical history of the life and habits of both husband and wife; (2) a complete physical examination of both parties; (3) an expert examination of the semen; (4) a pH test of the reaction of the vagina and an investigation of the cervix; (5) a demonstration, preferably by radiogram, of patency of the tubes; and (6) an investigation of the premenstrual endometrium and endocrine factors.

EXAMINATION OF THE MALE

Constitutional conditions lower the vital functions of the male more often than those of the female, causing chemical, cytological, and possibly serological changes in the masculine secretion. Dysfunction of anterior pituitary or thyroid gland is often the cause of faulty spermatogenesis. In some there is a psychological factor or there may be a definite focal infection or protein starvation.

I am aware that in general practice it is not always easy to obtain information from the husband, but seminal analysis is rarely objected to. My own procedure is to request the husband to wear a condom and have intercourse with his wife in the early morning. After removal, the condom is securely ligated at the top and placed in a thermos flask of water which has been prepared overnight at a temperature of 99°F. This is then sent within four hours to a pathologist for full biochemical and microscopical report. Such reports should be obtained more than once, for whereas necro-spermia or oligospermia may be the verdict on one occasion a return to normal is not uncommon, especially with treatment. A very common cause of complaint and of sterility is psychic premature ejaculation or inability of erection. Often in these cases the semen is quite normal and success can be obtained by its artificial insemination with a warm glass syringe. It needs to be repeated two or three times during the optimal period of conception, which according to Knaus is roughly the eleventh to sixteenth day before the first day of the next period. This procedure was adopted by John Hunter in 1799 for a case of hypospadias, with success.

General hygiene, diet, and the possibility of auto-intoxication need close inquiry. A restful holiday is advisable, and of late years treatment with thyroid extracts and gonadotropic hormones has sometimes proved an aid to spermatogenesis.

FACTORS AFFECTING FEMALE FERTILITY

First let it be stated that genital hypoplasia is by far the commonest single cause of primary sterility. It was responsible for 44 per cent of cases in my published series and for 40 per cent in Meaker's. Underdevelopment of the vulva, vagina, cervix, and uterus is as a rule easily detectable, and in some cases there may be hypertrichosis, girdle obesity, and a mammary mons. Perhaps the most constant and important feature, however, is delayed onset of menstruation which later is irregular, painful, or scanty. In women with this history abortion is common.

Treatment is here disappointing, for it is not the ovary that is at fault, but the anterior pituitary gland.

In some cases I have found thyroid gland and calcium useful, but there seems little doubt that in the future, gonadotropic substances containing active anterior pituitary hormone will be the recognized means of treatment. By way of prevention it will be necessary to regulate the general health and diet at or about the time of puberty, when the growth stimulus to the ovary should be actively functioning, and medical officers to girls' schools will be responsible for obviating future sterility.

The normal pH of the vaginal secretion is 4. If the secretion is profuse its acidity can immobilize the spermatozoa in a small amount of semen in 15 minutes, whereas if it is normal in quantity its acidity is countered by the alkalinity of the semen and the mobile sperm is able to reach the cervix, penetrate the normal mucous operculum by virtue of a mucolytic enzyme and reach the uterine cavity. On the other hand, in conditions of hypoplasia or pathological displacement of the uterus with ante-version of the cervix against the anterior vaginal wall, there may be difficulty in the spermatozoa reaching or landing upon the external os.

Using a capillator (British Drug Houses Ltd.) I have found that the cervical secretion is always alkaline (pH 8-9) and that this holds good whatever the degree of erosion, laceration, or infection. Outpatient practice and antenatal clinics have convinced me that these lesions are not themselves the cause of sterility, but they may well be associated with great viscosity and leucocytic infiltration of the mucous plug, which prevents access of the sperm to the uterus. This state of affairs can often be rectified by simple dilatation and drainage, coupled with linear cauterization or diathermy needling of retention cysts of the ovulæ nabothi. In lesser cases, removal of the viscous plug of mucus with a pledget of wool saturated in bicarbonate of soda solution or hydrogen peroxide has been successful.

TUBAL OCCLUSION

In Meaker's clinic emphasis is laid on the importance of obstruction to the internal ostia of the tubes by fibroids and adenomyomata, but these cases of relative sterility are comparatively rare in the early years of marriage and moreover, as a rule, the tumours are palpable and perhaps removable by myomectomy. Actually, occlusion of the tubes, from any cause, is responsible for sterile mating in but a small proportion of cases. Thus in my own series it was discovered in only 14 per cent of sterile women, and at Meaker's clinic in 12 per cent. This statement may cause surprise, for I am aware that many consider that sterility is usually due to salpingitis of old Neisserian origin. But my experience is that gonorrhœal obstruction is not common in sterility; and that occlusion, when present, is more often a result of septic or induced abortions, ectopic gestation, appendicitis, and, in private practice, certain contraceptive measures. Occasionally tuberculous peritonitis or cobweb veils of peritoneum may prevent the passage of the ovum from the ovary to the tube in women who have suffered from pelvic inflammation.

Twelve years' experience with Rubin's insufflation test and salpingograms, using lipiodol, has confirmed this view of the rarity of sterility due to occlusion and has also convinced me that the salpingogram has much more therapeutic and diagnostic value than insufflation. The air of carbon dioxide test has many fallacies. Spasm of the tubes at the isthmus may cause obstruction; only one tube may be patent; the sound of air entry and escape may be misdiagnosed; abnormalities of the uterus, and the site of occlusion, cannot be demonstrated. A salpingogram, however, in a case of sterility, is just as important for prognosis as a blood and urine examination in a case of nephritis. The site of occlusion is the main factor. If obstruction is at the isthmus, operations, however careful, are almost always useless; but if it is in the ampullary or fimbriated portion, there is at least a 20 per cent chance of success. Subsequent salpingograms are required one week, three

weeks, and six weeks after operation to check and improve the operative result; moreover if the surgeon should fail to leave the pelvis dry, the uterus anteverted, and the tubes and ovaries in normal position, there may be disappointment.

ANOVULAR MENSTRUATION

Lastly the visible and invisible pattern of the endocrine glands must be considered. The sedentary city worker and many young women with menstrual irregularities have a low basal metabolic rate with sub-thyroidism, probably dietetic in origin. It is perhaps significant that the adoption of an infant, with its release of maternal feelings, is often sufficient to stimulate normal function and so cause conception.

There is evidence, however, that certain women, like certain anthropoids, menstruate regularly, but without ovulation. In these cases the secretory of premenstrual phase, dependent on the hormone progesterin secreted by the corpus luteum, is absent, and Novak of Baltimore believes that the condition is very frequent. My own procedure in diagnosis is to ask the patient to attend one or two days before the expected date of menstruation. After the cervix has been cleansed a delicate spoon curette is passed up to the fundus, and a cheese-paring of the mucous membrane is removed and sent for section. No anæsthetic is needed. In a small proportion of cases it may be necessary to dilate the cervical canal up to no. 2 or 3 Hegar. If no progesterin is being secreted, the section will show no goblet cells, but only dilated acini.

The treatment of this anovular menstruation is promising, and I have published recently three out of seven cases of my own that became pregnant. Since then, on these lines, two more patients have become pregnant, one of these after ten years' primary sterility. All of them were given four intramuscular injections of 100,000 units of oestroform during the first two weeks of the cycle and three injections of pregnyl (100 rat units) during the first ten days, beginning on the seventeenth day. On the other hand, Clauberg gives a single large injection of potent oestrogenic hormone (e.g., 200,000 to 250,000 units) on the twelfth to sixteenth day of the cycle. He contends that there is a sharp release of gonadotropic substances followed by ovulation with subsequent luteinization and conception. His results are certainly inspiring. Others have reported good results from the injection of progesterone on alternate days from the seventeenth day of the cycle, with a view to the formation of a healthy nidus in the endometrium and lengthening the life of the corpus luteum.

My own clinical experience in India convinces me that anovular menstruation is common, for there, to-day, though marriage and sexual relationship still take place at a very early age, pregnancy seldom occurs until several years after the regular onset of menstruation. This suggests that menstruation without ovulation precedes the catamenial discharge, and that puberty and sexual maturation are two different things.

THINGS TO COME

From what has been said, it will be understood that sterile mating is usually due to impaired fertility on the part of one or both partners, each or both contributing some factor which may or may not be remediable. Under the heading of desirable 'things to come' I would place: (1) a complete physical examination of all men and women contemplating matrimony; (2) greater care of girls at puberty with a view to the prevention and treatment of hypoplasia; (3) a more general knowledge of sex hygiene, and the maintenance of marriage advice clinics; (4) stern admonition against the use of contraceptives during the first few years of marriage, and the legal forbiddance of their sale without medical prescription; (5) the abolition of the curette in the treatment of sterility and abortion; (6) investigation of both husband and wife after two years' fruitless marriage.

Reviews

CHANGE OF LIFE IN MEN AND WOMEN.—By M. C. Stopes, D.Sc., Ph.D. 1936. Putnam and Company, Limited (42, Great Russell Street, W.C.1), London. Pp. xiv plus 282. Price, 6s.

THE essential qualities of a medical cause suitable for a crusade are that it should be a genuine one, that the subject should have been largely neglected by the medical profession, and that it should be a popular one, in the sense that it must touch on the lives of the vast majority of human beings. The biggest advertising schemes fail in the end unless their promoters are giving to the public something that will do them good physically, the psychological effect of even the most skilled advertising being too evanescent. For example, the most successful of the widely advertised bowel correctives have as their basis purgatives that have been in the British Pharmacopoeia since it was first published; we all have bowels, most of them require to be moved now and then, and Dr. Pierce's purple pastilles will undoubtedly move them, even if they cost ten times as much as calomel and a dose of salts.

In the example we have taken the purpose is a commercial one, but the generality applies with equal force to campaigns which are purely philanthropic. A tuberculosis campaign would be a dismal failure unless we were able not only to offer the sufferers some hope of recovery but to demonstrate by numerous examples that cure can be effected, and it would get very little support from the public if it were not for the fact that there are few who have not some friend or relative with the disease and that all know that they or their sons or daughters may be amongst the next victims. On the other hand, a movement to supply cortical extract for the treatment of Addison's disease would be unlikely to make any headway as however effective the treatment may be in prolonging the lives of sufferers it lacks the popular appeal because not one in a thousand have ever heard of any one with the disease.

Dr. Marie Stopes' crusade against reticence in the discussion of sex matters in general and of the control of conception in particular had all the qualities essential for success. The cause was a good one. Not that it was immediately acclaimed as such; in fact, it aroused opposition from all quarters, particularly from the subconsciously conscience-stricken medical profession. (Is it possible to excuse the crime of letting loose a medical man on the public without giving him one word of instruction on the methods that should be used to prevent conception after legitimate sex union, so that such knowledge as he had on this subject he had to acquire from his or his friends' illegitimate experiences, when amongst his patients the need—on medical or social grounds—for exercising some preventive method probably occurred a dozen times a day?) The attitude of the medical profession has undergone a complete change during the last twenty years and to-day there are numerous ethical books written by well-informed medical men and women on contraception and on all aspects of sex relationship; of course, many others by prurient-minded opportunists have also appeared in the rush to fill the vacuum. Dr. Stopes' point of view has been so entirely vindicated and her ideas have been so completely absorbed into the later literature that those reading her earliest books for the first time might be excused for accusing her of plagiarism, in the same way that the American objected to one of Shakespeare's plays on the ground that it was so full of quotations.

We are not at all sure that she has not found another good subject for a crusade and another weak spot in the armour of the medical profession; whether her contentions regarding the climacteric in man can be upheld or not, she has in her latest book certainly served a good purpose in making the middle-aged man prostate-conscious, as amongst the many that consult their doctors to be assured that their prostates are as

normal as that of a new-born babe, a certain number will receive a timely warning that all is not well in that quarter, a warning that may help them to obviate operation at a later date.

As in all her books, Dr. Stopes scores a number of very good points against the general attitude of the medical profession, but, except in a few instances where she has been able to catch out individual medical writers, her specific charges are far less effective and therefore weaken her case very considerably; she is inclined to use the following form of argument too frequently 'It seems logical therefore to give.....I have yet to discover the medical practitioner who does so or who has even thought of.....'. The medical profession can scarcely be blamed for not basing their practice solely on *logical conclusions* which themselves are based on a knowledge of physiology which is far from perfect, even if it were as extensive as Starling's and we were to credit Dr. Stopes with a greater knowledge of medical science than the average medical man or woman. On the other hand, it seems possible that had half the practitioners in the country conceived and tested the same theory without getting any convincing results she might still have been left in ignorance of the fact.

A point that she makes is that during life a number of physiological crises occur of which the healthy human being is as unconscious as of the crisis of the sun passing the meridian on a summer's day, unless particular attention is drawn to them, and that the medical profession has selected the climacteric in woman as a subject to become hysterical about and has deliberately ignored the fact that in man a very similar crisis occurs. This she attributes to man's determination to dominate, to stress women's weaknesses and to ignore his own. We can scarcely support this charge against the male members of the profession of having an ulterior motive, but there is much truth in both of the other charges. Whereas the climacteric passes in the majority of women without any disturbance in her normal physiology beyond the cessation of the menses, a woman between the ages of forty and fifty is almost denied medical aid, except for conditions with gross physical signs, because of the certainty that she will be dismissed with a placebo, or a polyglandular prescription, on the assumption, expressed or hinted at, that her condition is due to 'the change'. This is perhaps a slight overstatement of the case and a judgment applied to the whole profession on account of a guilty few, but this is unfortunately how the public does judge the profession, and in the absence of clearer statements in the textbooks, it is difficult to refute the general charge.

The case for the male climacteric is not perhaps quite so clear, but undoubtedly in a very large number of men both mental and physical changes, unassociated with any particular disease, do occur between the ages of fifty and sixty, and there is little to be found about this or about the early changes in the prostate in any textbook. However, during the last few years, a considerable amount of investigation has been carried out on prostatic enlargement and observations have been made which in due course will find their way into the textbooks.

Change of Life is a book written for popular and not medical consumption, but medical readers, though they will find much in it to infuriate them, will also find much that is good for them to know and that will be very useful to them in their practices.

L. E. N.

THE RELIEF OF PAIN: A HANDBOOK OF MODERN ANALGESIA.—By H. Balme, M.D. (Durh.), F.R.C.S. (Eng.), D.P.H. (Lond.). 1936. J. and A. Churchill Limited, London. Pp. xvi plus 392. Price, 12s. 6d.

As the writer of the introduction of this book says, 'this is no philosophical treatise', but what a subject it makes for philosophical rumination! Is not the relief of pain, both physical and mental, the highest

object of medical science? Or perhaps we ought to say, should it not be? Does the obstetrician perform artificial respiration on the tenth unwanted child in the half-starved family because he wants to save a life, or because he wishes to save the mother the mental anguish and disappointment of its death? And does the family physician exercise all his art on the bed-ridden octogenarian to prolong his life, or to make his last days as comfortable as possible? But we must get back to the book which, as Sir Farquar Buzzard says, 'is not philosophical treatise, but a valiant and successful attempt to assemble and evaluate the weapons ready to our hands for the prevention and alleviation of physical pain'.

In part I, which consists of about 60 pages, the problem of pain is dealt with in a general way under the headings—the nature of pain, the pathway of pain, sensitivity to pain, pain and psychical phenomena, the classification of pain sensations, and the investigation of pain. In part II, the relief of pain is discussed under a number of general headings, e.g., pain from inflammatory disorders, pain from injuries, and pain from diseases of the nervous system, and in part III more specifically on a regional basis, e.g., pain in the chest, pain in the abdomen, and pains of labour. Part IV is headed the 'therapeutics of analgesia'; here again certain aspects of the treatment of pain are discussed in a general way, and one cannot help feeling that these chapters might have come earlier in the book with advantage. The first chapter is on rest and posture, the next is on baths and packs, and the third on movements, massage and electrical treatment; the two latter have been written by Dr. M. B. Ray, Physician to the Red Cross Clinic, Peto Place. The last chapter in the book is a glossary of analgesic drugs, and is a complete answer to a criticism that the reviewer thought of making after reading the earlier part of the book. This criticism was that the writer had used the names of proprietary drugs without indicating their composition; the composition of these and much other useful information is given in this final chapter. In this chapter histamine is given as '*Composition:—Amino-ethyl-glyoxaline*' which, even if it is correct, does not carry us any further forward, and histamine is surely 'common usage' in medical literature of the present day.

This book will be an invaluable addition to any practitioner's library; it really is a book for which there was 'a long-felt want', and it is difficult to see why no one has attempted to supply it before. We somehow feel that the author was predestined to write this book and that fate arranged that no one forestalled him. Even if the accident of birth and fate helped the author, he at least has played his part well and produced a book that should become a standard book of reference for the practitioner.

L. E. N.

CLINICAL HEART DISEASE.—By S. A. Levine, M.D., F.A.C.P. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 445. Illustrated. Price, 24s.

DR. LEVINE is a leading cardiologist whose work on coronary thrombosis and the monograph published on that subject are well known. This book is the product of the author's labour and experiences in cardiology, and as such is welcome. It presents in a simple form the important aspects of the diagnosis, prognosis and treatment of heart disease. The book has been written in such a way that each chapter may be regarded as distinct in itself and as a brief treatise on the subject with which it treats. The advantage of this is that each chapter can be read independently.

After the introductory considerations the author has described the important types of heart disease. For the most part opinions have been adopted that are shared by the present authorities on the subject.

In connection with rheumatic fever, the author insists on the recognition of atypical cases which are of common occurrence. Although there are no pathognomic

signs to detect such cases, the author has observed that 'spontaneous repeated epistaxis' or 'repeated vomiting spells' in children are characteristic atypical signs. Constitutional factors, such as freckles and red hair, frequently associated with hyperextensive fingers and pinkish coloration of the sclera, have been regarded as suggestive of rheumatic diathesis, but these have not been established on a firm scientific basis.

Special topics, viz., 'the clinical significance of systolic murmurs', 'acute cardiovascular emergencies', 'heart disease as surgical or obstetrical risk', etc., have been dealt with adequately in separate chapters. Sections on angina pectoris and coronary thrombosis have been well written. Thyroidectomy performed in a series of over 30 cases of angina pectoris under the author's care gave fairly satisfactory results. A skin test has been described to differentiate rheumatic fever from bacterial endocarditis. (It is worth trial in this country where rheumatic infection is fairly common.)

The statement (p. 157) that marked freckling of the back of the forearms is unusually common in hypertensives and probably denotes a vascular vulnerability and that hypertension occurs more in the females than males is open to question.

The author considers that aortic stenosis (always regarded as a very rare disease) is frequently overlooked and one common complication of it is angina pectoris.

While diagnosing a case of subacute bacterial endocarditis, one should consider the possibility of the case being kala-azar, especially in a tropical country such as India.

The last chapter (113 pages) has been devoted to clinical electrocardiography. The illustrations are good. The curves are consistently clear and well reproduced. The use of chest leads, especially in connection with coronary thrombosis, has been emphasized. The standards of the voltage of waves are somewhat different from those given by Pardee.

The entire field of cardiovascular diseases has not been covered. Inclusion of sections on signs and symptoms of congestive cardiac failure, blood pressure and radiography of the heart would make the work more useful. On the whole, the volume is good and well produced and should appeal to the general practitioner.

R. C.

A HANDBOOK OF OPERATIVE SURGERY AND SURGICAL ANATOMY WITH CHAPTERS ON INSTRUMENTS.—By K. K. Chatterji, F.R.C.S.I., Lieut.-Colonel, I.T.F. Third Edition. 1936. Published by Messrs. Butterworth and Company (India), Limited, Calcutta. Pp. xxii plus 443. With 282 illustrations, 17 in colour. Price, Rs. 15

In the preface of the new edition of a *Handbook of Operative Surgery and Surgical Anatomy with Chapters on Instruments*, Dr. K. K. Chatterji expresses the hope that the book may prove to be 'of greater utility to teachers, pupils and practitioners'. It is an ambitious and hazardous undertaking for one, particularly when 'authorship conflicts with the calls of practice'.

There being no dearth of excellent handbooks on these subjects, the present volume is liable to be subjected to an exacting scrutiny and critical appraisal. It runs the additional risk of being compared with such classical compendiums as McGregor's, or Treves and Choyce's *Surgical Anatomy* and Waring's *Manual of Operative Surgery*, or Treves and Wakeley's *Handbook of Surgical Operations*. Admittedly, the book under review could not claim to replace or supplement any of those just mentioned. It is, therefore, unlikely to be of any special value to the medical student, preparing for his final examination in surgery.

Let us take a subject at random—appendicectomy—McBurney's and Battle's incisions have been described, but there is no mention of the low paramedian incision, which may be regarded as the incision of choice, particularly in female subjects. McBurney's point is usually described erroneously, having been copied from book to book, in this respect the present book is no exception. In the original statement, it is given as being between

1½ inches and 2 inches from the right anterior superior iliac spine upon a line joining that spine with the umbilicus. According to the author, it is the usual seat of maximum pain, but McBurney's point, as described by McBurney, is the classical point of greatest tenderness in appendicitis. Exigencies of space do not allow us to refer to other instances.

The printing, illustrations and get-up are very good indeed, but there are some incongruous diagrams, which ought to have been omitted.

DISEASES OF THE EYE.—By H. Kirkpatrick, M.B., Lieut.-Col., I.M.S. (Retd.). Second Edition. 1936. Butterworth and Co. (India), Ltd., London. Pp. xiv plus 164. Illustrated. Price, Rs. 7. Obtainable from Messrs. Butterworth and Co. (India), Limited, Calcutta

THE second edition of Col. Kirkpatrick's little book will be welcomed by both students and those who have to conduct undergraduate teaching of ophthalmology in India. It is much better produced than the previous edition, paper and cover being far superior. The introduction of plates has also added to its appearance and value. The uncoloured plates of external diseases (except one) are selected reproductions from water-colour pictures of actual patients painted by the artist at the Government Ophthalmic Hospital, Madras. The complete collection of the past 20 years is hung in the museum block of the hospital known as the Elliot School and duplicates in many cases have been presented to the London School of Tropical Medicine. They naturally look better in colour, but those reproduced here look well in black and white.

As the author has stated 'an attempt has been made to condense the subject into a small compass' and readers will find that in this he has been most successful and appreciate the volume for its brevity combined with its great practical value. One of its chief features is that it is based on ophthalmology as taught and practised by the author in the Madras clinic during his superintendency. Important changes up to date which concern the student and the practitioner are however now incorporated. As a readable, concise and well presented small textbook the work is eminently suited to the Indian undergraduate.

The author and publishers are to be congratulated on the many improvements which ought to insure its surpassing the success of the first edition.

MEDICAL RESEARCH COUNCIL. THE INFLUENCE OF DIET ON CARIES IN CHILDREN'S TEETH. (FINAL REPORT).—By The Committee for the Investigation of Dental Disease (Assisted by A. Deverall and M. Reynolds). Special Report Series, No. 211. Published by His Majesty's Stationery Office, London. 1936. Pp. 137. Price, 2s.

THE subject of diet and dental caries provides a very good example of the difficulties of medical research. Five reports have now been issued on this subject; three on Mrs. Mellanby's work and two of the Dental Disease Committee of the Medical Research Council, and a conclusion has been arrived at about which the average educated mother would say 'Of course, I knew that; my great-grandmother used to give my grandmother cod-liver oil when she was a child and she always had excellent teeth'. Nevertheless, this report marks the conclusion of a brilliant and a very important piece of research work.

The field investigation that was described in this final report was carried out in institutions in Birmingham over a period of some years. The object and the conclusions of the investigation are summarized in the two following quotations from the report:

'The main object of the investigations was to test the effect on the initiation and spread of caries of adding fat-soluble vitamins, especially vitamin D, to the

basal diets existing in the institutions. Two groups were used as controls, as it was thought possible that some preliminary information might be obtained as to the relative effects, if any, of a neutral fat and a carbohydrate; no controlled investigations of this nature having previously been made'.

'The investigations described in this report show conclusively that a relatively high vitamin-D content of the food can do much to diminish the incidence of caries if the vitamin is given during the development of the teeth; that a beneficial effect may be obtained if the vitamin is given at a fairly late stage of development; and that even when it is given after the eruption of the teeth, the onset and spread of caries is delayed'.

This is a report of considerable importance to doctors, dentists, sanitarians, and welfare workers in this country.

L. E. N.

MEDICAL RESEARCH COUNCIL: INVESTIGATIONS ON RESPIRATORY DUST DISEASE IN OPERATIVES IN THE COTTON INDUSTRY.—By C. Prausnitz. Special Report Series, No. 212. Published by His Majesty's Stationery Office, London. 1936. Pp. 73. Illustrated. Price, 2s. 6d.

INDUSTRIAL diseases will assume greater and greater relative and actual importance in this country as the years pass, for two reasons—one, that epidemic diseases are undoubtedly being affected by sanitary reform and will we hope continue to be controlled and the other, that the number of industrial workers is yearly increasing. The cotton industry is a particularly important one in India and therefore the results of this investigation are probably directly applicable to our conditions.

Professor Prausnitz shows how he studied the problem of 'strippers' asthma' from many angles, so that he was led ultimately to the view that there is a specific agent in cotton dust capable of producing the observed symptoms and ultimately the pathological changes in the lungs which cause complete disablement in a number of workers exposed to cotton dust for a long time. As a result of an able and laborious research, he has shown the strong probability that this substance, or group of substances, is contained in the protein fraction of the dust and is responsible for the changes which may occur in the lung after prolonged inhalation. He does not think that histamine, although present in cotton dust, is the toxic agent at fault. Professor Prausnitz has also established the existence of super-sensitiveness (allergic sensitiveness) in all patients suffering from this respiratory dust disease, and concludes that in this respect it is related to ordinary asthma.

It seems clear from the results obtained that there is only one method of overcoming this disability of the cotton industry, and that is by preventing access of the finest dust to the respiratory tract. It would appear that the ventilating and exhaust appliances which are now generally in use, although they remove the coarser particles of cotton dust from the atmosphere, do not in fact prevent access to the worker of the finer particles which are particularly liable to produce intense irritation of the respiratory system in those susceptible to the dust. Now that this essential fact is established by Professor Prausnitz, the practical problem seems to rest on the need of discovering a method of removing these finer particles. The ingenuity of the engineer which is shown in the modern machinery of the cotton industry ought to have relatively little difficulty in solving this mechanical problem and so eliminating an important cause of ill health among industrial workers.

We have not been able to gather whether Professor Prausnitz thinks that the super-sensitiveness that he has observed in all sufferers is an in-born allergy, an acquired sensitiveness through exposure, or an in-born tendency which has been developed through long-continued exposure to the allergens.

The report is one of primary importance to those interested in industrial disease and its control in this country.

L. E. N.

MEDICAL RESEARCH COUNCIL: THE NUTRITIVE VALUE OF FRUITS, VEGETABLES AND NUTS.—

By R. A. McCance, E. M. Widdowson, and L. R. B. Shackleton. Special Report Series, No. 213. Published by His Majesty's Stationery Office, London. 1936. Pp. 107. Price, 2s.

'THE Medical Research Council have always placed the subject of nutrition in the forefront of their programme, and more especially the study of those problems of health and disease which are related to qualitative differences in the chemical composition of various foods and diets. Great advances have been made in fundamental knowledge in this respect, but full application of the experimental results to human dietetics cannot be made without exact knowledge of the amounts of the different substances which are present in foods and available for the body's use. The Council have thus recognized that one of their duties was to support work directed to this end.

Hitherto unsuspected entities of food are continually being recognized as of importance in nutrition. This fact alone is enough to necessitate new analyses of foodstuffs. Further, the figures for the better known constituents, published by workers in various parts of the world, differ widely in many cases: this has indeed been a source of real trouble to nutritional investigators, and to all whose work has involved practical planning of diets on an accurate basis.

To meet these difficulties, Dr. R. A. McCance and his colleagues have given much time to examining and analysing foods commonly eaten in Great Britain; and their work at King's College Hospital, London, has been assisted by grants from the Council. Two reports have already been published; the present report completes another chapter of this extensive investigation, and deals with the chemical composition of fruits, vegetables, and nuts, and the changes in their constituents brought about by cooking. Perusal of the report will impress the reader not only with the skill but also with the immense amount of labour necessary to obtain the results, for determinations have been made of such numerous and varied items as titratable acidity, reducing sugars, glucose, fructose, cane sugar, starch, total solids, water, nitrogen, total and phytin phosphorus, sodium, potassium, calcium, magnesium, copper, iron and chloride.

The authors have given some attention to a special aspect of the problem with which experimental workers have long been familiar. This is the fact that a chemical analysis of a food may sometimes be misleading as a guide to its nutritional value, because some of the material estimated may not be available for nutrition. Thus, Dr. McCance has himself shown, with Miss Widdowson, that about half of the phosphorus of phytin passes through the alimentary canal without being absorbed. For this reason, and to emphasize the falsity of assuming that the total phosphorus of food is at the disposal of the body after ingestion, Dr. McCance and his colleagues have determined the phytin phosphorus, as well as the total phosphorus, in many foods. In all probability a similar discrepancy exists between the total and the available iron in foodstuffs, and such observations may be of wider import than is at present recognized. There is a further complication in that the presence or absence of one constituent in a food may influence the availability of others. There are many examples of this, of which perhaps the best is the increased retention of calcium and phosphorus by the body in the presence of additional vitamin D. Investigators of nutrition must therefore be alert to the possibility of introducing errors into their work by assuming that the total content of the various nutritional factors in a food is necessarily available for nutrition'.

Two conclusions regarding the effect of cooking are of special interest, the former because it explodes a common fallacy of pseudo-scientific writers, and the second because it provides a special warning to slimming females (and males):—

'The waste incurred by throwing away the water in which vegetables have been boiled is surprisingly small. Conservative methods of cooking vegetables are unlikely to increase the calcium, phosphorus and iron in mixed diet by more than 3 per cent'.

'Potatoes were found to lose nothing but water when they were cooked in air or fried in fat. Potatoes and bread absorbed fat on frying and these changes together increased the calorific values of the fried foods to about three times their original values'.

This special report constitutes a very valuable book of references.

MEDICAL RESEARCH COUNCIL: CATALOGUE OF THE NATIONAL COLLECTION OF TYPE CULTURES.—Maintained by the Council at the Lister Institute of Preventive Medicine, Chelsea Bridge Road, London, S.W. Fourth Edition. Special Report Series, No. 214. Published by His Majesty's Stationery Office, London. 1936. Pp. 159. Price, 2s. 6d.

'DURING the five years that have elapsed since the publication of the third edition of the Catalogue of the National Collection of Type Cultures of micro-organisms, many species of bacteria and micro-fungi have been added. Not only has the number of types conserved shown an increase, but also, through the co-operation of other scientific institutions, it has become possible to include in the catalogue important groups of organisms at present conserved by specialists elsewhere and not actually maintained in the National Collection itself.

Following the recommendations of the Nomenclature Committee, the use of the specific name *Bacillus* has been restricted in this edition to spore-bearing bacteria, the question as to whether anaerobic spore-bearing bacteria should be segregated in a separate genus—*Clostridium*—being left to a future decision of the Nomenclature Committee. Most of the non-sporing bacteria have been listed, without prejudice, under *Bacterium*; others under *Lactobacillus*, *Acetobacter*, *Brucella*, *Salmonella*, and so forth. The status of the genus *Bacterium* is likely to be a matter for early consideration by the Nomenclature Committee. With regard to the genus *Salmonella*, the taxonomic and nomenclatural position of this important group of food-poisoning organisms was made the subject of a special investigation by a sub-committee of the Nomenclature Committee of the International Society for Microbiology.

It is hoped that this new and revised edition of the Catalogue of the National Collection of Type Cultures will be of increased service to microbiologists in this country, throughout the Dominions and Colonies, and beyond. Attention is again directed to the continued need for the deposition of newly-described species and also for fresh examples of types at present conserved in the Collection. It is only by constant augmentation and replenishment with such material that the curator and staff will be able to satisfy the requirements of workers at home and abroad, in the various fields of microbiological research, and thus contribute effectively to that international reciprocity in microbiological science which is so greatly to be desired'.

DISEASES OF THE RESPIRATORY TRACT: EIGHTH ANNUAL GRADUATE FORTNIGHT OF THE NEW YORK ACADEMY OF MEDICINE. 1936. W. B. Saunders Company, Philadelphia and London. Pp. 418. Illustrated. Price, 24s.

THE book consists of a collection of twenty lectures on 'diseases of the respiratory tract' delivered on the occasion of the Eighth Annual Graduate Fortnight organized by the New York Academy of Medicine.

Twenty different diseases have been discussed by eminent contributors who can speak with authority on their respective subjects. The conditions discussed include asthma, common cold, influenza, bronchiectasis, and emphysema. The discussions present in a concise form up-to-date information about the aetiology and treatment of respiratory diseases.

D.

MATERNITY AND POST-OPERATIVE EXERCISES—IN DIAGRAMS AND WORDS.—By M. Morris, C.S., M.M.G. In collaboration with M. Randell, S.R.N., S.C.M., T.M.M.G. 1936. William Heinemann (Medical Books), Limited, London. Pp. xvi plus 152. Illustrated. Price, 7s. 6d.

This book is primarily intended as a textbook for masseuses, midwives and nurses who have taken the diploma of the International Institute of Margaret Morris Movement, but it will also appeal to obstetricians and surgeons. Professor R. W. Johnstone writes an introduction and speaking of his experience of the use of these exercises in the Edinburgh Maternity Hospital strongly recommends them and considers the safeguards described to be adequate. Professor John

Fraser writing as a surgeon, of the post-operative exercises, says, 'I have been impressed by the great practical value of the technique which Miss Margaret Morris recommended'.

This book contains a detailed description of twenty-one exercises suitable for expectant and nursing mothers and for post-operative conditions. There are also special 'pelvic joint stretching', 'labour' and 'delivery' exercises to train the expectant mother in the use of the muscles which come into use at the time of childbirth, to help her to help herself at this time and to co-operate with the obstetrician. The exercises are illustrated by diagrams. There is also a section on the technique of deep breathing, relaxation and development of good posture which form such an essential part of the Margaret Morris Movement and are recognized to have such an important effect on physical and mental efficiency.

This book could safely be put into the hands of intelligent patients. It is clearly and attractively written and the writer's enthusiasm for the subject is infectious. It is definitely a book to be recommended, and covers ground which is given scant attention in textbooks of obstetrics or surgery.

M. N.

Abstracts from Reports

THE REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF THE PUNJAB FOR THE YEAR 1934

EXCEPT for some recrudescence of plague the year on the whole was a healthy one. There were no abnormal climatic conditions and food prices showed a distinct decline. The number of births registered fell from 1,042,624, in 1933, to 938,630, during the year under report. The figure for 1933 was, however, abnormally high. In 1932 the number was 970,236. The birth rate in the province is still the highest in India with the exception of the Central Provinces. The number of deaths registered was 649,775 as against 660,542 in 1933. The number is higher than in any of the years 1927 to 1932. There was a decrease of 24,860 in the number of deaths registered of children under one year of age. In the year 1933, however, the figure was exceptionally high, showing an increase of 27,551 over the previous year. The rate per mille for such deaths in 1934 was 187.40, which is not abnormal. It will, therefore, be seen that the number of registered births exceeded the number of registered deaths by 288,855, which represents the estimated increase in population for the year. The estimated increase since the census of 1931 is 1,223,141. This steady increase in the population may perhaps be considered satisfactory from the public health point of view, but it has less gratifying reactions in other directions, and if continued indefinitely may become alarming.

Cholera.—The incidence of cholera was again very low and the number of seizures is the lowest on record. This decrease is all the more remarkable because there was a marked increase in the year 1934 in other provinces including the neighbouring province of the United Provinces, which was heavily infected. There has been a steady decrease in the mortality from this disease in the province since 1928. A grave situation was presented by infection brought to the village Pharal (Phalgu) in Kaithal tahsil at the end of August by a pilgrim from Hardwar. This caused anxiety in view of the important fair held at the village at the end of September. Drastic precautionary measures were taken with the result that no case of cholera occurred at the fair.

Smallpox.—In 1934 there was a sudden drop to 1,692 deaths, which is the lowest figure since 1923. Thirty per cent of the deaths occurred among children under

one year of age and 44 per cent among children between the ages of one and ten years, which emphasizes the need for re-vaccination.

There was a decrease in the total number of vaccinations from 3.2 to 3.1 millions. In view of the small number of cases of smallpox this is not remarkable and the number of vaccinations per death from smallpox is the highest on record. The report shows that the experiment of employing women vaccinators has so far proved somewhat disappointing.

Plague.—There was a marked recrudescence of plague. The number of cases rose from 3,047 to 10,335 and of deaths from 1,789 to 8,069. Sixteen districts were infected, of which Gujrat and Hoshiarpur supplied by far the greater number of cases. There are, therefore, indications that a period of plague activity is beginning of which the main focus is the Hoshiarpur district. The heavy incidence of the disease in the sub-tahsil of Mukerian in the Hoshiarpur district is ascribed partly to the conditions brought about by heavy rainfall in the autumn. The humidity of the atmosphere was favourable both to the activity and vitality of the flea and also of the plague bacilli carried by it. In addition to the usual preventive operations a special campaign was carried on in the infected areas for deratting and improvement of village sanitation.

Other diseases.—The number of deaths under the head of fevers, which was noted to be abnormally high in the report for 1933, again rose slightly. From the fact that the heaviest mortality was in the months of December and January, that the figures probably include deaths which were really due to pneumonia and other diseases.

Malaria only occurred in a mild epidemic form.

The measures against hookworm were continued in the Shakargarh and Batala tahsils of the Gurdaspur district, and preventive treatment administered to 43.9 thousand persons. The hookworm survey was also extended to the districts of Ambala, Hoshiarpur and Sialkot. Hoshiarpur was found to be heavily infected. The campaign will be carried on on the same lines.

The leprosy campaign was continued and a number of villages in Karnal, Jullundur, Ludhiana, Rawalpindi and Multan districts were surveyed, as a result of which 266 cases were detected in addition to 37 new cases detected in Kangra district. Thirty-one doctors were trained in modern methods of diagnosis and treatment

making a total of 129 doctors so trained up to date. The report shows that there is a welcome increase of interest in the campaign against the disease among the public.

Urban sanitation.—Rupees 1,37,000 were allotted to the sanitary board at the beginning of the year for works in urban areas and were spent on the Montgomery and Bhiwani drainage schemes, which are being carried out by the public health circle of the public works department. The superintending engineer's report shows the progress made in a long list of works being carried out by that department for Government and local bodies. New schemes to the value of 25 lakhs have also been prepared. In spite of restricted grants to local bodies for such works the superintending engineer reports that very good progress has been maintained in the construction of works and that new schemes involving mechanical installations to the extent of over 400 brake horse-power have been started. The expenditure on public health measures by municipal committees, including grants from Government, amounted to Rs. 42.4 lakhs as against 38.7 lakhs during the previous year. The director of public health considers that there has been some improvement in the upkeep of municipal works though there is room for much more. The superintending engineer, public health circle, is not so hopeful and reports that in most towns the plant of the sanitary installations continues to deteriorate through neglect of repairs and renewals and even of lubrication. His remarks illustrate the vital importance of maintaining a thoroughly competent technical staff and the dangers of allowing valuable machinery to remain in charge of persons lacking the necessary skill.

The report emphasizes the need for improvement in conservancy, and it is apparent that most committees lose an important source of income by neglecting to make good arrangements for the disposal of sullage and street sweeping.

Rural sanitation.—Rupees 75,000 were allotted to the sanitary board for works in rural areas of which Rs. 40,000 were actually spent, mainly on water-supply schemes.

Village sanitation is still largely in the propaganda stage, but the report gives interesting statistics of practical work done, in cleaning wells, constructing parapets, making *pucca* drains and manure pits, and opening ventilators. An important part of the work of the department in rural areas consisted as usual in making sanitary arrangements for fairs. The success in preventing cholera at the Pharal fair in Karnal district has already been mentioned. The report shows in detail the measures taken. This phase of the work of the department will be increased by the extension of the list of important fairs at which the aid of the department is called in.

Maternity and child welfare.—The number of health centres rose from 58 to 64, eight new centres being opened and two being closed owing to the difficulty in finding lady health visitors. This seems to indicate that the number of visitors trained at the Punjab Health School is insufficient to meet the demand. The 8 stipendiary students trained during the year were posted shortly after qualifying. In the new course 8 stipendiary and 3 paying students were admitted. The statistics for work done at the health centres show that progress is being made though the total number of *days*, trained or under training, amounts only to 2,196. Regular inspections were made by the inspectress who was satisfied with the way the work was being done.

ABSTRACT FROM THE REPORT OF THE HONORARY SECRETARY (MRS. C. L. PASRICHA), CALCUTTA HEALTH WEEK. 1936

Of the three office bearers of our committee who have been responsible for the management of the Calcutta health week for some years, only one remains

with us now. The departure of Lady Birkmyre who was president for six years was a great loss to us.

This year's exhibition was originally arranged for five days, from the 14th to 18th February, but, as on the last day there was no sign of any diminution in the number of people who came to see the exhibition, we decided to extend it for one more day. In spite of the fact that there was only limited publicity of this extension it was very gratifying to see the large numbers of people who came on the last day.

The exhibition was opened on Friday, February the 14th, by the Hon'ble Sir Bijoy Prasad Singh Roy. After 5 p.m. on that day the exhibition was open to the public.

Saturday, Sunday and Monday were the busiest days. In the mornings we had a reasonable attendance, reasonable in the sense that everyone could see and study the exhibits, but towards the afternoon the crowds that poured into the museum were too great even for the spacious galleries and the large quadrangle of the building. So great was the rush on Sunday that the gates had to be closed several times to prevent overcrowding. I would like to stress, that the great majority of the people who came to the exhibition were obviously of the literate class. They took an active interest in the exhibits, listened to the demonstrators, and were there to learn and assimilate what the exhibition had to teach them. They were not mere idlers come to see a show; one could not help feeling that there was a genuine desire to know how to live healthily, and to ward off disease. The people were seeking instruction and guidance from the exhibition as to health matters.

Monday, 17th February, Ladies' Day, was a particularly busy one. Till 2 p.m., men accompanying their womenfolk were allowed in, but after that time arrangements for strict purdah were made. The medical student demonstrators and the boy scouts, who had been on duty till then, were replaced by a band of lady volunteers and girl students from Vidyasagar and other colleges and institutions. Every stall had lady demonstrators and the girl students also had to undertake the control of traffic, not an easy task. Mrs. K. C. De as usual took charge of the general situation. The quadrangle was full, and it was with great difficulty that Miss Burton secured a little space for the physical demonstration that she had arranged and which proved very popular.

So many women came that afternoon that there was scarcely standing room.

Lectures on popular subjects were given every day and were well attended. A series of broadcast lectures were given before the exhibition for which our thanks are due both to the speakers and to the Broadcasting Company. Physical demonstrations by boys and girls were arranged by Miss Burton and Mr. Buchanan.

More than 200 medical students volunteered as demonstrators and approximately 200 more demonstrators were arranged for by stall-holders. The demonstrators have a hard task to perform, and the real success of the exhibition depends on them.

An entrance fee of one anna was charged every day this year. As in the past, the fee was collected only from the more opulent and those who were willing to pay. All others were admitted free; none were turned away. The gate money collected this year was a little over Rs. 900, an increase of Rs. 150 over last year. In 1934, Rs. 222 were collected, 1935 Rs. 796 and this year a little over Rs. 900. Taking the donations for the past four years we see also evidence of increasing appreciation of the responsibility of the people, the donations, excluding in each year the Government grant, were in 1933 Rs. 2,458, in 1934 Rs. 2,469, in 1935 Rs. 4,377 and this year a little more than Rs. 4,700.

The increasing interest of the visitors to the exhibition is illustrated by the sale of literature during the last 4 years. In 1933 Rs. 104 were collected, in 1934 Rs. 80, in 1935 Rs. 62 and this year Rs. 242.

At the final general meeting in March 1934 the Calcutta health week committee assumed responsibility

for the policy and finance of the infant welfare centre. The centre has had another successful year. The clinic staff has been in touch during 1935 with 362 ante-natal mothers, 323 infants and 129 toddlers in 1934. The number of school children medically examined has increased from 118 in 1934 to 396 in 1935.

The antenatal, midwifery, infant welfare, child welfare and school medical services have been supplemented during the year by the opening of a nursery school for children from two to five years of age and by the provision of two observation cots for cases of difficult feeding among children. The playground for the use of which we are greatly indebted to Rai Bahadur Ram Dev Chokhany has been well equipped. It is very popular with both mothers and children.

An effectively run clinic has a great, if not a greater, propaganda value than the intensive campaign for health carried out during the week of the exhibition, and one of the best uses to which the surplus funds of Calcutta health week can be put is the financing of the Calcutta health week clinic.

ANNUAL REPORT OF THE ALL-INDIA INSTITUTE OF HYGIENE AND PUBLIC HEALTH FOR THE YEAR 1935. BY DR. R. B. LAL, OFFICIATING DIRECTOR

DURING the year under report the institute was unfortunate in losing the services of three distinguished members of the staff. Lieut.-Col. A. D. Stewart was on leave for the greater part of the year and during his absence Lieut.-Col. A. A. E. Baptist acted as director. Col. Baptist who, as assistant director of the institute, was closely associated with Col. Stewart in working out the details of the scheme and later in the administration of the institute, shares the credit equally with Col. Stewart. His retirement on 17th July was a matter of sincere regret to his co-workers. Dr. Orkney, professor of maternity and child welfare, was transferred to Delhi as director of the maternity and child welfare bureau. Her colleagues and co-workers will always miss her. Dr. Neal-Edwards relieved her on the 13th December, 1935.

The year under review, which was only the second year since the recruitment of the professorial staff, may be said to have witnessed steady and satisfactory progress in the achievement of all the objects for which this institute was established. The primary function of the institute is to impart post-graduate training in all branches of public health to the medical men and women who intend taking up public health as their career.

In this connection I would like to comment on one important aspect of teaching, namely, field work. I believe there is considerable room for improvement in this branch of instruction. At present the students receive training in the routine and special duties of medical officers of health under the health officer, Calcutta Corporation. Besides, they are given a number of demonstrations at places of public health interest in and outside Calcutta. A malaria centre has also been established near Burdwan to provide facilities for field studies in rural malaria. These facilities are, to my mind, inadequate. We must not forget that a very large proportion of India's population lives in villages. The deplorable state of environmental and personal hygiene in our rural areas is proverbial and it is being increasingly recognized that improvement of these areas must be kept in the forefront of our public health programmes. It is evident therefore that a rural bias must be given to our courses of instruction. The ideal arrangements for giving the requisite training would be, to attach the students for some time to really efficient rural health centres. Here the students could easily gain an insight into the problems of rural sanitation and acquaint themselves with rural public health administration in actual process of working. Such centres would, in fact, be analogous to hospitals for medical students. With this object in view Col. Stewart and the representative of the Rockefeller Foundation

in India initiated a scheme for a rural health unit in Bengal, and on their advice, the director of public health submitted a scheme to the Local Government. The representative of the Rockefeller Foundation also secured some financial assistance from that institution. On account of financial stringency, however, the Government of Bengal did not find themselves in a position to give administrative approval to the scheme. It is earnestly hoped that, with the return of better times, the Government will see their way to reconsider the matter and eventually to establish a health unit near Calcutta. This will add considerably to the usefulness of the institute and will generally stimulate the public health activities in the province.

Many health workers feel that, on account of lack of contact with academic centres and rapid advance in public health sciences, they require a general revision course to brush up their knowledge. Some others find that the special nature of their duties demands a higher knowledge of certain subjects than is provided for in the ordinary D. P. H. course. To meet these requirements 6 three months' post-graduate courses were drawn up in the following subjects:—biochemistry, nutrition, vital statistics and epidemiology, malaria, maternity and child welfare, and a combined course.

Research and investigation: Cholera.—In last year's report Col. Stewart discussed cholera problems in India and abroad in a general way. He mentioned that the institute was engaged in investigations into some of the important problems, which had so far eluded solution, particularly the rôle of carriers in initiating epidemics. These problems were not only of primary importance to India, but also to the world at large. In these investigations, the School of Tropical Medicine and the Central Research Institute at Kasauli are intimately associated. The general plan of work of the associated enquiries was explained in the last report to which reference may be made. It will suffice here to say that these enquiries continued to work on the lines laid down by the cholera advisory committee.

To investigate the problems concerning the persistence of infection during the inter-epidemic periods, the reasons why infection lies dormant during these periods and the factors concerned with its re-activation, the rôle of carriers in initiating epidemics and other unsolved problems, an intensive field study has been undertaken in a small endemic area.

Suggestive evidence has been obtained associating carriers with cases. Preliminary investigations seem to suggest that organisms undergo changes in the intestine of man during the course of convalescence as also in the intestine of carriers. Different types of organisms may be found at the same time amongst the different members of a family. Serological tests so far available are inadequate for distinguishing between virulent and avirulent organisms; nor do they provide satisfactory information regarding their epidemiological studies.

Dr. Linton's studies on the chemical constitution of vibrios have undoubtedly added to our knowledge regarding the characteristics of virulent organisms.

Epidemic dropsy.—The epidemiology, especially the ætiology, of epidemic dropsy which is a disease peculiar to the eastern part of India is still obscure. The institute co-operated with the School of Tropical Medicine to carry out investigations on this disease. A number of field studies were conducted, one centre being in Bihar and Orissa, one in a part of Calcutta City and three in different parts of Assam. The most striking fact brought out was the special predilection of the disease for the middle class people. Neither the very poor nor the very rich persons were affected. Again the disease was usually restricted to certain communities in a given place, but the communities escaping infection in one place were sometimes severely involved in another locality. Age distribution was also striking.

Dr. Wilson and his co-workers have recently contributed a paper on 'The diet survey of certain sections of communities in Calcutta'. They have studied the usual diet of twelve middle class Hindu families and three institutions, namely, a Moslem and a Hindu

Anglo-Indian school. In their studies a hostel Bengalee young men each earning, Rs. 40 a month, and this they have fairly representative of upper standard of unmarried wage earners with other obligations. It was concluded that the food of all the groups investigated was deficient in total and animal fat, in calcium and to a certain extent in phosphorus. They recommended that the best way to meet these defects would be to make a substantial addition of milk and other dairy products to the day's fare and to partially substitute wheat flour for rice. These findings, though based on rather small data, are quite significant especially when it is remembered that the subjects of investigation belonged to comparatively better classes of the population. While much remains to be done in the way of diet surveys one fact stands out clearly, and this cannot be too strongly emphasized, namely, the immediate need of a national milk programme.

The aetiology of blackwater fever is still shrouded in mystery, and its patchy distribution in malarial tracts has baffled epidemiologists. Dr. Krishnan's previous studies on the subject led him to search for an explanation on biochemical lines. As a result of his investigations he has been able to put forward a tentative theory of the mechanism of hæmolysis in blackwater fever which, if confirmed, will suggest a rational method of treatment of this fatal disease. He believes that sudden hæmolysis in blackwater fever is due to disorders of metabolism which, on the one hand, results in the production of hæmolytic substances in the form of unsaturated fatty acids and lecithin and, on the other hand, in a lowering of protective free cholesterol. His main contribution is the observation that while the total cholesterol content of blood may show no change, there is a distinct fall in the free cholesterol content. Blood glucose is also diminished by defective metabolism of carbohydrates, which results in the formation of fats and fatty acids, some of which deviate cholesterol and form astrocholesterol. He is now proceeding with a rational treatment based on the above theory and has obtained some encouraging results in monkey malaria.

Field studies in malaria were also conducted by the malaria department mainly with the object of discovering the causes of endemicity in certain areas. Two field investigation centres were established, one in the endemic and the other in the epidemic areas. While no conclusive explanation of endemicity has yet been found, certain suggestive factors have been noticed in connection with mosquito breeding. Permanent accumulations of water which were found in the non-endemic areas in larger numbers did not favour breeding to the same extent as the temporary ones did. Again, jute steeping, which was extensively practised in the epidemic but not in the endemic area, was also definitely inhibitory to mosquito breeding.

Maternal mortality is one of the most urgent public health problems in this country. There is much unnecessary waste of life which can be prevented. The life of the lying-in mother is not as safe as it might be in a civilized country. In fact this problem has not yet received the attention of research workers to the desired extent. It is proposed to enquire into the chief causes of deaths associated with childbirth by a detailed study of all such deaths occurring in Calcutta.

Dr. Ukil has continued to work on a number of problems on tuberculosis with the help of the grants from the Indian Research Fund Association. His contribution on the incidence of the disease amongst the home contacts, specially the children, in relation to the environmental conditions in Calcutta has added a great deal to our knowledge of the epidemiology of the disease. In the course of his bacteriological studies on 143 autopsies he was able to isolate 60 strains all of which were found to be of the human type. This is of very great interest as it shows that man is the reservoir of infection here. This conclusion is further confirmed by the fact that all the 73 strains isolated

from pulmonary and extra-pulmonary patients were of the human type.

REPORT ON THE PUBLIC HEALTH ADMINISTRATION OF THE CITY OF RANGOON, FOR THE YEAR 1935

THE monthly mean temperature throughout the greater part of the year was above the normal. The rainfall was a little higher than that of the previous year as well as the mean of the last five years.

The year from the point of view of public health was a period of great anxiety. Three epidemics had to be faced. Smallpox and cholera prevailed in an epidemic form in the first quarter of the year and epidemic dropsy in the rainy season.

Ninety-five cases of cholera with 69 deaths were reported during the year as compared with six cases and four deaths in the previous year, the average number of deaths during the last ten years being 48. Twenty-seven per cent of the cases were ascertained to have been imported from the infected districts of the Delta where cholera had been prevalent since the month of November of the previous year. Besides effecting improvements in the water supply and latrine accommodation of the mill areas, strenuous efforts were made for mass inoculation against cholera of the population specially exposed to infection with a view to localizing the disease. Over 14,000 inoculations were performed within seven weeks of the occurrence of the first case. Eighty-four per cent of the labouring population in the rice mills of Dalla and 80 per cent of Kanaungto were inoculated, after which the disease began to decline and practically disappeared by the middle of the year.

A serious outbreak of smallpox occurred at the same time, there being 530 cases with 172 deaths, as against 235 cases and 75 deaths in the preceding year. The average number of deaths during the last ten years was 188. To cope with the epidemic, an intensive vaccination campaign was launched in addition to the usual measures adopted for control, and during the months of February and March alone 105,512 persons or more than one-fourth of the total population of the city were vaccinated. Of the total number of vaccinations performed during the year by the corporation staff nearly 64 per cent was done in these two months. Similarly, out of the total number of 288,534 vaccinations performed by all agencies, 104,512 or 36 per cent were done in the months of February and March alone. The effects of the vaccination campaign were striking. The number of smallpox cases which in the month of March was twice that of February was reduced to half in the month of April. The month of May registered a similar decline and the city passed through the crisis of a somewhat severe epidemic with a comparatively small toll of deaths.

The third epidemic to be fought during the year was that of epidemic dropsy in the rainy season. Four hundred and twenty-nine cases with seven deaths were reported, the mortality rate being 1.63. Detailed investigations were carried out into all the cases of epidemic dropsy reported to this department. The explosive nature of the outbreak suggested that the disease was brought about suddenly by some toxin and did not result from any deficiency of diet. Seventy-two per cent of those attacked belonged to the Bengali community. As the consumption of rice appears to be in some way connected with epidemic dropsy, warnings against its use were issued by means of handbills and the local press. The disease showed a seasonal prevalence, being well marked in the first half of the rainy season with a tendency to decline towards the end of it.

The number of deaths from plague (17) during the year showed some reduction when compared to last year (27) and the average of the last ten years (151).

Cerebro-spinal fever was responsible for six deaths as against four of the previous year and the average (seven) of the previous ten years.

Diphtheria accounted for seven deaths during the year as compared with ten of the previous year, the average of the last ten years being seven.

No deaths were recorded from typhus fever although the number of cases notified to this department increased from eight of the last year to 16, this increase is mainly owing to the better methods of diagnosis now adopted.

There was a slight increase in the number of deaths from enteric fever (49) during the year as compared to that of the last year (46), the average of the previous ten years being 64.

The number of deaths from tuberculosis increased from 831 in the previous year to 952 during the year under report, the average number of deaths during the last ten years being 903. The tuberculosis dispensary, which is the first stage in the fight against this disease, was opened towards the end of the year. Other organizations necessary for the control of this disease have yet to develop. The public appears to be mostly apathetic towards the problem of tuberculosis and it is hoped that its interest will be aroused by the work which the corporation has now undertaken. Social problems are involved in the fight against this disease and public interest and co-operation are as much needed as municipal enterprise if its ravages are to be checked. In the city there appears to be an urgent need of an anti-tuberculosis society or association which may form a liaison between the tuberculosis patients on the one hand and the institutions where treatment is offered, on the other.

Four hundred and forty-four deaths were attributable to diarrhoea and dysentery as against 508 deaths from the same diseases in the preceding year. The average of the last ten years was 863. The number of deaths from these diseases during the year was the lowest on record.

The death-rate of the city increased from 23.66 in the previous year to 25.14 during the year under review. For purposes of comparison, the death-rates in 1935 of the three Presidency cities in India and the three largest towns in Burma are given below:—

Rangoon	..	..	25.14
Bombay	..	..	25.20
* Calcutta	..	..	28.5 to 29.9
Madras	..	..	38.60
Mandalay	..	..	36.16
Moulmein	..	..	29.76
Bassein	..	..	30.64

* Exact figure not available owing to the recent change in the boundaries of Calcutta.

Cholera (+85), smallpox (+97), tuberculosis (+121), diseases of the respiratory system (+134) and injuries (+22) were amongst the principal causes responsible for the rise of the death-rate.

The main factors that operated to keep the death-rate from tuberculosis and respiratory diseases at a high level were poverty, exposure, and lack of nourishment and treatment during illness. The effect of the general economic depression during the last few years must be reflected in the lowered state of the vitality of the community and the consequent increase of the number of deaths from diseases which are attributable not so much to lack of municipal activity as to the state of the vitality of the community. During the early phases of economic depression when unemployment begins to occur people have some savings or reserves to fall back upon and its effects may not be so evident as in the later period when the continuance of unemployment over some years leaves the unemployed no alternative but to buy cheaper articles of diet with low nutritive value. The latter phase of economic depression is, therefore, apt to be marked by a lowered vitality of the community in general and the consequent increase, firstly, of the sickness rate and then of the mortality rates. If the number of patients seeking treatment at the municipal dispensaries is a reliable index of the former, its increase during the last few years provides ample corroboration to the view that sickness has been

increasing. The probability of increased popularity of these institutions has, however, to be kept in view. The effects of economic depression from a public health point of view in communities where no system of unemployment relief is in force must be far greater and more readily obvious when compared with countries where measures for the relief of the unemployed and the ailing are parts of the policies pursued by the State. The fall of death-rate in times of prosperity and its rise in periods of scarcity are, therefore, important factors to be borne in mind in assessing the state of public health of any place by the consideration of its vital statistics.

The infantile mortality rate (251.35) fell during the year and was the lowest on record, the last year's figure being 270.81. The lowering of the infantile mortality rate in spite of the rise in death-rate is somewhat remarkable and appears to be indicative of the good effects of the scheme for the reduction of infantile mortality that was put into operation in 1934. The rate is, however, still very high and there is no cause for optimism about it. The percentage of women attended to by unqualified women during their confinements fell from 41.10 per cent during the last year to 36.58 during the year under review. The need for the extension of free midwifery service in the outlying parts of the town, however, still remains acute.

In view of the increasing danger of the spread of yellow fever towards eastern countries on account of the acceleration of aerial traffic, the corporation, towards the end of the year, decided to increase the strength of anti-mosquito inspectors from 4 to 18 for a period of one year. This staff could not, however, be engaged till the end of the year under report.

The number of deaths from malaria (80) declined as compared with that of the last year (99).

The corporation decided during the year to depute a special inspector to collect the data in connection with the milk supply of Rangoon. When these are available it may be possible to formulate definite proposals for improvement.

The number of persons treated at the corporation dispensaries increased from 114,612 during the last year to 135,882 during the year under report, an average daily attendance being 1,007 as against 739 in the previous year and the total attendance 306,798 as against 269,215 of the last year.

The water supply of the city was chlorinated throughout the year and continued to be of a high standard of bacteriological purity.

REPORT OF THE HAFKINE INSTITUTE, BOMBAY, FOR THE YEARS 1932 TO 1935. BY LIEUT.-COL. S. S. SOKHEY, I.M.S., DIRECTOR

GENERAL REVIEW

THE years under review (1932 to 1935) have been a period of considerable stress for the institute. Early in 1933, the prevailing financial stringency forced the Government to close down one whole department (the Department of Pharmacology) and to retrench two senior officers. At about the same time the Central Government withdrew their officer, thus reducing the total strength of the senior staff from six officers to three. This reduction of the staff coincided with a greatly increased demand for plague vaccine. In the financial year (April 1933 to March 1934) alone, the institute issued over 2 million doses as against the average yearly demand of 1 million. In addition, in pursuance of the policy of enlarging its usefulness to the presidency, the institute, in spite of the greatly reduced staff, took up the preparation of other vaccines required by the public health authorities. Thus in 1934 and 1935 were prepared and issued over 600 thousand doses of cholera vaccine, 17 thousand doses of typhoid vaccine and 55 thousand doses of meningococcal vaccine. The institute also gave assistance to the Director of Public Health and the Inspector-General of Prisons by sending out workers to investigate the outbreaks of cerebro-spinal fever. The keenness of the workers and-

their devotion to duty enabled the institute to meet this demand as well as the increased demands for its products; and what is of still greater importance, the workers carried out important researches, especially in plague. Some of these plague researches constitute a great step forward since the days of the plague commission.

PLAGUE DEPARTMENT

(1) *Plague vaccine*.—The recorded plague deaths are the only indication we have of the incidence of the disease in the country. If the general case mortality has not varied materially during past years, the recorded deaths may be used as an index of incidence, and as such, if plotted against the quantities of the vaccine used yearly, the increasing recognition that this preventive measure is receiving from the health authorities and the public is very evident. During the four years under review 5.9 million doses of vaccine were issued, as against an average of 4 million for a similar period before, although there was no marked increase in the incidence of the disease.

Researches in connection with plague vaccine.—The lack of a standard method of testing the virulence of plague cultures and the variety of unstandardized experimental conditions employed by different workers led to contradictory conclusions being put forward. The work of no two workers could be directly compared, nor could that of the same worker done at different times. No data were available from which one could decide what type of vaccine was best, and what methods should be followed for the preparation of the plague vaccine. This state of uncertainty was very disturbing to the institute, as it was, and still is, the largest producer of plague vaccine in the world. About 1929, Sokhey with the assistance of Maurice started fundamental research into these problems. His earlier work was reported in the previous reports, but during the period under review this work has reached a state of completion permitting him to draw definite conclusions.

He has worked out an exact method for measuring the virulence of plague cultures, and has found that the mouse is the animal of choice for plague experiments. Further, he has evolved an exact biological method for the standardization of plague vaccines, with every condition of the experiment fully standardized, so that the method can be employed by a worker anywhere and would still yield directly comparable results. This is the first instance of a successful standardization of a bacterial antigen and marks a great advance in plague work in recent years.

This has had immediate practical results. It has enabled the protective power of Haffkine Plague Vaccine to be raised thirty-fold and more. Exact determinations show that the institute's vaccine is anywhere from 8 to 100 times more potent than any other plague vaccine on the market.

More important still, Sokhey has found that heat-killed vaccines do confer a very high degree of protection on the mouse, rat and guinea-pig, and are superior in this respect to live avirulent culture vaccines. He has developed methods to maintain undiminished for long periods the virulence of plague strains and also to render them avirulent without destroying their antigenic power. He was thus in a position to have at the same time the same strain of organism in a fully virulent form and in an avirulent form, thus making it possible for the first time to measure the protective power of the same strain in two forms.

Failure of previous workers to protect animals against plague with heat-killed vaccines is explained by the fact that they exposed their cultures to unnecessarily high temperatures for unduly long periods of time: for killing their cultures they used temperatures of 60°C. to 70°C. for one hour to two hours. New methods of measurement have shown that these high temperatures destroy the protective powers of a plague vaccine.

(2) *Anti-plague serum*.—The new knowledge of the characters of *B. pestis* which Sokhey and Maurice gained

by their work on plague vaccine has enabled these workers to make fresh efforts at producing a curative serum against plague. They have succeeded in producing a serum which exact laboratory experiments show to be possessed of great potency. With this serum 70 to 80 per cent of infected laboratory animals can be saved, while none could be saved with any of the serum on the market. No suitable opportunity has occurred to enable these workers to test the value of their serum in the treatment of human cases, except that a trial is in progress at the time of writing, and the early results show that while the case mortality in untreated cases is 76 per cent, the case mortality in treated cases has been reduced to 18 per cent. The full significance of these preliminary results can be realized only if compared with the results of previous trials of other sera. Between 1897 and 1912, six different sera (Yersin's, Lustig's, Terni's, Haffkine's, Brazil's and Rowland's) were tried and they failed to make any appreciable reduction in case mortality; the case mortality among the untreated cases was between 70 and 85 per cent, while the case mortality among the treated cases was between 65 and 82 per cent. A serum prepared in this institute by Naidu, when tested at Poona in 1933, reduced the case mortality to 60 per cent among the treated cases as against a mortality of 85 per cent among the untreated.

(3) *Plague phage*.—Furious controversy rages round the question of bacteriophage and its value as a prophylactic and therapeutic agent. Attempts have been made to solve the problem on the basis of statistical data collected in the field and clinical tests. Both these methods are notoriously difficult to assess. Laboratory animal experiments necessary for the ultimate solution of the problem have so far not been possible. In the case of cholera, typhoid and dysentery infections, the typical diseases cannot be produced in any laboratory animals, and in the case of other infections no standardized experiments have been devised.

As soon as Sokhey and Maurice had worked out an accurately standardized animal experiment in the case of plague they undertook to test the value of plague phage. The results show that plague phage has no action in the body either as a prophylactic or as a curative agent.

(4) *Chemotherapy of plague*.—A number of mercury and phenol compounds were synthesized in the institute, and two proprietary drugs, Merthiolate and Salyrgan, were tested by Taylor and Wadia. None of these drugs proved successful.

Later Sokhey tried Trypa-flavin (Bayer) intravenously in experimentally infected mice. The drug is reputed to retain its bactericidal power in blood, but in the case of plague bacteriemia it had no effect.

(5) *Serology of plague*.—During the work on the production of anti-plague serum, Sokhey and Maurice had developed exact quantitative methods for measuring the protective and therapeutic value of the sera produced. These methods, though exact, require a large number of mice and involve a period of about a month for each test. It was, therefore, considered desirable to develop serological methods to see if they could be made to replace the biological test. Furthermore, the exact relationship of the serological tests to biological reactions is not known, and this was considered to be an excellent opportunity of gaining knowledge in this field of bacteriology.

First Greval and Dalal, and later Wats and Wagle, have worked on the problem of devising and standardizing agglutination and complement fixation techniques applicable to *B. pestis*. The work is proceeding.

(6) *Epidemiology of plague*.—This department performs many duties: (a) Training is given in plague epidemiology and preventive measures to health personnel of the presidency as well as of other provinces and Indian States. Over 50 men received training during the period under review. (b) In collaboration with the Bombay municipal authorities it examines between 2,000 and 3,000 rats every morning for signs of

plague. This is a very important measure in safeguarding the health of the city of Bombay. Epizootic plague has never been absent from Bombay since the first introduction of the disease in 1896, but the epizootic is now at a very low level, and during the last eighteen months not a single plague-infected rat has been found. (c) Poona, Bijapur, Belgaum, Sawantwadi and Kolhapur were visited for demonstrating methods of rat and flea destruction with proprietary calcium cyanide preparations. (d) During 1933 Chitre was deputed to Poona in connection with the plague epidemic. (e) A systematic investigation into the relative susceptibility of rats to plague from different areas in India, which had suffered from epidemic plague in varying degrees at some time during the present pandemic (1897 to 1935), has been continued. This enquiry has now covered the whole of India except Bengal. The immunity of rats appears to be roughly proportional to the aggregate incidence of plague in the area from which rats are obtained.

(7) *Rat and flea destruction.*—Though plague vaccine confers a very high degree of immunity it should never be made the sole preventive measure; the extermination of rats and their fleas in human habitations should be energetically conducted, thereby eliminating altogether the risk of human infection. So long as we had to depend on trapping and baiting of rats the position was hopeless. But the new proprietary calcium cyanide compounds promise to be of great value in this connection.

A method has been worked out for measuring the relative utility of the different compounds available and experiments are being conducted to determine the best methods for the fumigation of dwellings with these products.

DEPARTMENT OF PHARMACOLOGY

This department was started in 1924 and after working for nine years, during which period valuable researches on indigenous drugs were carried out, was closed down in 1933 on account of financial stringency.

The reopening of this department on a permanent basis is an urgent necessity, and it is hoped that Government will find funds for the purpose. In the meantime the department has temporarily been opened with the generous assistance of the Indian Research Fund Association. The services of a highly trained pharmacologist (Dr. B. B. Dikshit) have been placed at the disposal of the institute and already valuable research work in connection with plasmoquin has been produced.

DEPARTMENT OF BIOCHEMISTRY

This department has proved of great value both to the workers in the institute for chemical aid in their work as well as to practitioners and hospitals for examination of their clinical material.

The department has been closely associated with research work in connection with preparation of anti-plague serum, and has continued its work on the determination of normal standards of chemical constituents of blood of adult Indians. The department has now, in addition, taken up vitamin assay work.

ANTIRABIC DEPARTMENT

The number of cases of dog-bite receiving treatment has shown a progressive increase during the years under review. The mortality rate has varied between 0.12 per cent and 0.24 per cent. This compares very favourably with the previous years and the results of other institutes in India. A great deal of this improvement is very likely due to the complete disinfection of all wounds carried out in this institute.

The institute has consistently worked for decentralization of treatment. It is gratifying to note that there are now 62 centres in the Presidency at which anti-rabic treatment is given. A scheme is under consideration for opening still more.

TUBERCULOSIS INQUIRY

This inquiry, financed by the Indian Research Fund Association, was brought to a close early in 1933. During 1932-33 Dr. Soparkar and his assistants continued to work on the filterable form of the tubercle bacillus. The existence of filterable form of the tubercle bacillus has not received general acceptance and there are outstanding names amongst supporters as well as antagonists of this hypothesis and the subject is still controversial.

[Part II of the report describes in detail the various researches outlined above. This portion is not suitable for abstraction, but is full of valuable information and should be consulted in the original by interested workers.]

ADMINISTRATION REPORT OF THE ACTING DIRECTOR OF MEDICAL AND SANITARY SERVICES, CEYLON, FOR 1935

PUBLIC HEALTH AND GENERAL EPIDEMIOLOGY

General remarks

THE western province was subject to the malaria epidemic which broke out in an unprecedented form towards the end of November 1934, and continued with some severity till March 1935. At the end of April there was a marked recrudescence of malaria which did not abate till the end of June. There was a small outbreak of cholera at Peliyagoda which was soon brought under control. Twenty-three cases of plague and 45 cases of smallpox occurred.

In the central province, there was an increased attendance for malaria treatment in the Teldeniya, Kandy, Matale, and Nawalapitiya areas and also in the valleys adjoining the Kehelgamuwa river and Maskeliya-oaya. As a result of the drought the figures for dysentery and typhoid were also above the average in the Kandy, Matale, and Teldeniya areas. Gampola also recorded an increase of the dysentery rate last year and more people were treated for malaria than in the previous year at Dambulla Hospital.

In the southern province the malaria outbreak continued during the year but fortunately with less intensity than in other parts of the island. In the Hambantota District there was a fall in the number of cases by about the end of March, but a recrudescence occurred in the Matara-Wellaboda pattu soon after; the wave of intensity appeared to spread from a centre in the Weeraketiya area outwards until, with the onset of the south-west rains, it had extended to the whole of the Matara District. By August there were definite indications that the intensity was diminishing and conditions were almost normal soon after.

The northern province registered a fall in the death rate in 1934 from 27.7 in 1933 to 25.2 in 1934, but there was a slight increase to 25.55 in 1935. The infantile mortality rate also, although it fell from 200 in 1933 to 199 in 1934, has increased to 201.9 in 1935. There was a decided increase in the amount of malarial fever especially in the first quarter of the year after the heavy rains at the end of 1934. The number of deaths from dysentery rose from 295 in 1934 to 406 in 1935.

In the eastern province, as an outcome of the prolonged drought, there was acute food shortage particularly in Batticaloa South. The general health of the inhabitants therefore suffered considerably. Incidence of malaria was more than usual throughout the province in the first and fourth quarters of the year.

In the north-western province the epidemic of malaria, which started towards the end of 1934, was particularly severe during the months of January and February, but began to subside in the beginning of March. In the middle of April however a second wave of less intensity was experienced affecting chiefly the Chilaw District. Dysentery was also much more

prevalent than in recent years and a severe epidemic broke out between May and July in a group of villages near Bingiriya. The general death rate rose from 27 in 1934 to 63.9 and the infantile death rate from 215 to 628 per 1,000 births.

In the north-central province, the number of malaria cases treated was the highest ever recorded, and as usual it reached its highest level during the months of January and December. Cases of dysentery and *parangi* treated during 1935 were fewer than 1934, and the latter disease showed a considerable decrease.

The Uva province had a second year of drought in 1935. There was a general increase of malaria in the low-country all through the year. In the montane and sub-montane regions there was an epidemic of malaria, but it began only in June, reached its peak in October and gradually declined.

In the province of Sabaragamuwa, the epidemic of malaria which started during the latter part of 1934 continued until the middle of the year. The Kegalla District was most severely affected. The western part of the Ratnapura area did not suffer as much as during the latter part of 1934. There was a rise in the number of cases of dysentery.

The most prevalent general diseases of hospital inpatients were rheumatism, intestinal disorders (diarrhoea and enteritis), bronchitis, and pneumonia. Year by year the number of patients who seek hospital treatment for cancer is increasing.

Principal communicable diseases. Plague.—The 60 cases of plague in 1935 show an increased incidence of the disease compared with the average for the previous five years (53). Of these, 42 cases were bubonic and 18 septicemic.

Cholera.—There have been 30 cases with 22 deaths.

Smallpox.—There were 115 cases of smallpox with 15 deaths.

Enteric.—There were 2,387 cases admitted to hospital with 543 deaths and the total number of deaths from this cause is 690. The actual prevalence of the disease cannot be judged from hospital admissions since many cases resort to ayurvedic treatment and the majority of these probably are not notified. The number of registered deaths does not indicate the actual mortality from this disease, as some deaths from enteric are undoubtedly included amongst those reported as due to pyrexia.

One thousand, nine hundred and ninety-one cases were notified in 1935 to the sanitary branch of the department as compared with 2,785 in 1934.

Dysentery.—There were 7,858 hospital admissions with 1,429 deaths and the total number of deaths registered in the island was 6,175. Four thousand, four hundred and eighty-seven cases or 57.1 per cent of the total number of cases were stated to be amoebic and 1,667 cases or 21.2 per cent bacillary. These figures, however, are not of great value since the distinction was often made on clinical grounds. Only a small percentage of the cases was submitted to complete laboratory investigation and among them the bacillary type greatly preponderated.

Thirty-nine thousand, eight hundred and eighteen outpatients were treated for this disease during the year, as against 34,369 during 1934.

Tuberculosis of the lungs.—The number of hospital cases in 1935 was 4,851 with 1,382 deaths as against 4,278 with 1,126 deaths.

Leprosy.—During the year 1,261 cases with 97 deaths, as against 1,242 cases with 100 deaths in 1934 were treated at Government hospitals including the two asylums which are maintained in the island for the segregation of lepers.

Parangi (yaws).—Owing to decrease in the number of cases, the itinerating medical officers who numbered 13 in 1930 were reduced to 4 in 1931 and 2 in 1933. The work of these two officers had to be suspended from November 1934 till the end of 1935 owing to the malaria epidemic.

HYGIENE AND SANITATION

General review

Public health work has made steady progress during the year.

Control of soil pollution through construction, maintenance, and use of sanitary latrines is recognized by the authorities and the people as necessary in conserving health. As evidence of this are the aided schemes for provision of private latrines by Urban District Councils by which they contribute the whole or part of the cost and recover the money in small instalments. Voluntary organizations have been formed in rural areas to promote health work and they have made latrine construction their chief project. One of the forms of relief work in the malaria districts by Government was the installation of pit latrines. The only part of the island where satisfactory progress has not been made is the northern province where there is still a good deal of opposition to latrine construction.

General sanitation continues to be satisfactory in urban and rural areas. A scheme of work which promises to be of great use in the future progress of health work in the island is the securing of the co-operation of the people by the formation of health leagues for the promotion of health work in their respective areas. This has been successfully carried out in a number of rural districts. The formation of health leagues is engineered by the sanitary inspector of the area and the leagues make themselves responsible for providing squatting plates and getting people to build latrines, for protecting wells from pollution, for seeing that communicable diseases are reported and for assisting in child welfare and school health work. The medical officer of health and the sanitary inspector work through these leagues.

Provision of protected water supplies in urban and rural areas has been kept in view. Although much progress has been made with the protection of wells in rural areas and in the investigation of sources of piped supplies for urban areas there is, nevertheless, a large population that is not provided with a wholesome supply of drinking water.

Control of communicable diseases continues to receive attention. There was an outbreak of cholera at Peliyagoda with a few cases in Colombo during the early part of the year, the infection being introduced from India. There was also a fairly large outbreak of smallpox at Welitara near Balapitiya due to infection from Colombo which had it from India. Both outbreaks were promptly dealt with. Plague is endemic in Colombo and fresh infection from time to time is introduced from outside. Control of the disease in Colombo, which is still under consideration, is of importance to towns in the interior of the island. The enforcement of antiplague measures throughout the island is being carried on but the progress made is slow. There have been outbreaks of dysentery of the bacillary type. Typhoid fever is being controlled through inoculations, the value of which people are beginning to appreciate as demonstrated by the readiness with which they seek and submit to them. With funds provided by the Rockefeller Foundation, an investigation into the incidence of typhoid of Kalutara which was commenced in 1934 was continued during the year.

Maternity and child welfare work continues to be popular and the value of the work is appreciated both by the local authorities and the general public as evidenced by the attendance at clinics and instances of co-operation in the form of donation of buildings for child welfare work. The Urban District Councils are beginning to provide maternity homes for the expectant mothers of their areas.

School health work has been carried on as reorganized in 1933. An additional medical officer was appointed for school health work in the Colombo Mudaliyar's division. Work had to be curtailed in three school medical officers' areas for short periods on account of

the malaria epidemic, and many of the district medical officers who were carrying out work could not contribute much on account of their having increased work in their hospitals on account of the malaria outbreak. School health education received increasing attention and more interest was created in it by the offer of a shield by the Society of Medical Officers of Health of Ceylon for the school that carried out the best school health education programme. Special emphasis was placed during the year on the correction of defects. Increasing interest is being taken in the health of the school child, and as a result midday meals were provided at Government expense during the malaria epidemic in areas affected by the outbreak, with much benefit to the children, and the question of the provision of midday meals throughout the island is receiving the attention of Government.

The leprosy survey staff has completed the eastern and the western provinces and during the year work was carried on in the southern province. With the

completion of the southern province it is not proposed to take up the other provinces till the scheme of work is in satisfactory operation in these three provinces.

Ankylostomiasis campaign: Introduction.—The activities of the ankylostomiasis campaign were seriously handicapped in every direction by the malaria epidemic which began to make itself felt during the fourth quarter of 1934, and continued its ravages unabated far into the year 1935.

Anthelmintics used during the year were oil of chenopodium, carbon tetrachloride and tetrachlorethylene. Towards the close of the third quarter, 12th September, 1936, the issue of carbon tetrachloride from the civil medical stores ceased and tetrachlorethylene was used instead.

[This is a very long and detailed report and as such is chiefly of local interest and is not suitable for further abstraction. We recommend its perusal to medical and health officers, as they will find within its pages much to interest and instruct them.]

Service Notes

APPOINTMENTS AND TRANSFERS

LIEUTENANT-COLONEL T. C. BOYD is confirmed in the post of the Principal, Medical College, and Superintendent of the Medical College Hospitals, Calcutta, with effect from the 14th May, 1932.

Lieutenant-Colonel T. C. Boyd, Principal, Medical College, and Superintendent, Medical College Hospitals, Calcutta, is appointed to officiate as Surgeon-General with the Government of Bengal, with effect from the 31st October, 1936, *vice* Major-General D. P. Goll, granted leave.

The services of the undermentioned officers of the Indian Medical Service are placed permanently at the disposal of the Government of Bengal, with effect from the dates given against their names:—

Lieutenant-Colonel E. H. V. Hodge. Dated 26th February, 1934.

Lieutenant-Colonel P. F. Gow. Dated 2nd June, 1934.

Lieutenant-Colonel J. C. De. Dated 7th December, 1934.

Lieutenant-Colonel H. S. Cormack, M.C., Medical Superintendent and Ophthalmic Surgeon, General Hospital, Rangoon, is appointed to officiate as Inspector-General of Civil Hospitals, Burma, for 3 months and 9 days, with effect from the 2nd January, 1937, *vice* Colonel N. S. Sodhi, granted leave.

Lieutenant-Colonel R. H. Candy, on relief, is appointed to be Civil Surgeon and Superintendent, B. J. Medical School, Poona, *vice* Captain H. S. Smithwick.

On return from leave, Lieutenant-Colonel W. J. Webster, M.C., is appointed as Officiating Assistant Director, Central Research Institute, Kasauli, with effect from the date he assumes charge of his duties.

Lieutenant-Colonel H. E. Murray is, on return from leave *ex-India*, reappointed as Surgeon Superintendent, Presidency General Hospital, Calcutta, *vice* Major T. H. Thomas, granted leave.

Lieutenant-Colonel M. A. Singh, Superintendent, Presidency Jail, is appointed to act as the Inspector-General of Prisons, Bengal, during the absence, on leave, of Lieutenant-Colonel R. E. Flowerdew, or until further orders.

Lieutenant-Colonel P. C. Banerjee, on general duty at the Medical College Hospitals, is appointed to officiate as Superintendent, Campbell Medical School and Hospital, *vice* Lieutenant-Colonel J. C. De.

Lieutenant-Colonel J. C. De, on return from leave, is appointed to officiate as Principal, Medical College, and Superintendent, Medical College Hospitals, Calcutta, *vice* Lieutenant-Colonel T. C. Boyd.

The services of Major D. Kelly are placed permanently at the disposal of the Government of the Central Provinces, with effect from the 8th April, 1934.

The services of Major G. P. F. Bowers are temporarily placed at the disposal of the Government of Bihar, with effect from the afternoon of the 25th September, 1936.

The services of Major S. C. H. Worseldine are placed temporarily at the disposal of the Chief Commissioner, Delhi, for appointment to officiate as Civil Surgeon, New Delhi, with effect from the 16th October, 1936.

The services of Major G. J. Smith are placed temporarily at the disposal of the Government of Burma for employment in the Jail Department, with effect from the date on which he assumes charge of his duties.

The services of Major M. S. Gupta are placed at the disposal of the Government of Bihar for employment in the Jail Department, with effect from the date on which he assumes charge of his duties.

The services of Captain J. P. J. Little are placed temporarily at the disposal of the Government of the Punjab, with effect from the 1st September, 1936.

The services of Captain F. A. B. Sheppard are placed temporarily at the disposal of the Government of Madras, with effect from the 3rd September, 1936.

The services of Captain A. M. Sheridan are placed temporarily at the disposal of the Government of the United Provinces, with effect from the 5th September, 1936.

The services of Captain W. W. Laughland are placed temporarily at the disposal of the Government of Bihar for employment as Medical Superintendent, Ranchi European Mental Hospital, with effect from the afternoon of the 24th September, 1936.

The services of Captain G. F. Taylor, an Officiating Agency Surgeon, are placed temporarily at the disposal of the Punjab Government for appointment as Professor of Clinical Medicine in King Edward Medical College, Lahore, with effect from the forenoon of the 1st October, 1936.

On return from leave Captain M. L. Ahuja, an officer of the Medical Research Department, is placed on foreign service under the Indian Research Fund Association, with effect from the date on which he assumes charge of his duties.

Captain H. S. Smithwick, on relief, is appointed to officiate as Civil Surgeon, Sholapur, *vice* Mr. J. F. Henriques.

Captain E. H. Lossing, on general duty at the Medical College Hospitals, Calcutta, is appointed as 2nd Resident Medical Officer at the Presidency General Hospital, Calcutta, *vice* Dr. W. A. Browne, transferred.

LEAVE

Major-General D. P. Goil, K.H.F., Surgeon-General with the Government of Bengal, is granted leave for 3 months and 28 days, with effect from the 31st October, 1936.

Colonel N. S. Sodhi, M.C., Inspector-General of Civil Hospitals, Burma, is granted leave on average pay for 3 months and 9 days, with effect from the 2nd January, 1937.

In modification of previous orders Lieutenant-Colonel J. S. Galvin, Officiating Superintendent, St. George's Hospital, Bombay, is granted leave on average pay for 6 months and 19 days, with effect from the 11th October, 1936.

Lieutenant-Colonel E. C. A. Smith, Superintendent, Central Mental Hospital, Yeravda, is granted leave on average pay for 7 months and 4 days, with effect from the 5th March, 1937.

Lieutenant-Colonel R. E. Flowerdew, Inspector-General of Prisons, Bengal, is allowed leave for 6 months, with effect from the 19th November, 1936, or any subsequent date on which he may be relieved.

PROMOTION

Majors to be Lieutenant-Colonels

J. S. Galvin. Dated 5th September, 1936.

A. M. V. Hesterlow. Dated 14th September, 1936.

J. R. Kochhar. Dated 16th September, 1936.

Note.—The promotion of Major P. N. Lahiri to his present rank is antedated to 28th January, 1931. He qualified for accelerated promotion on 13th July, 1936.

H. R. Cursetji. Dated 1st October, 1936.

S. L. Bhatia, M.C. Dated 8th October, 1936.

G. R. McRobert. Dated 13th October, 1936.

A. C. Chatterji. Dated 17th October, 1936.

Lieutenants (on probation) to be Captains (on probation)

P. A. Hubbard. Dated 13th May, 1936, with seniority from 27th December, 1935.

F. E. McLaughlin. Dated 19th May, 1936, with seniority from 27th December, 1935.

Captains to be Majors

A. Rosenbloom. Dated 3rd September, 1936.

C. A. Bozman. Dated 3rd September, 1936.

RETIREMENT

Lieutenant-Colonel M. A. Rahman. Dated 22nd October, 1936.

RELINQUISHMENT

(Temporary Commission)

Captain K. B. Gore. Dated 1st September, 1936.

Note

'RYZAMIN-B'

RICE POLISHING CONCENTRATE

'RYZAMIN-B' consists of the concentrated and purified vitamin-containing fraction of rice polishings (recognized as a rich source of vitamin B), and has a potency of not less than 50 international units of vitamin B₁ per gramme. Thus it is possible to add to the diet an adequate supply of the anti-neuritic factor in a relatively small bulk. Doses of vitamin B, which could not be tolerated by many patients in the form of yeast concentrate, may thus be given with safety.

Vitamin B₁ is stated to promote appetite, to aid digestion and to bring about increased tonic and

absorptive powers of the digestive tract; it stimulates the general metabolic processes, promoting growth, and acts as a valuable prophylactic against polyneuritis. Further, it is stated to be necessary for normal reproduction and lactation.

'Ryzamin-B' is suggested, primarily, as a dietary reinforcement for patients of all ages, to stimulate appetite and promote utilization of food; secondly, where there is anorexia and loss of weight, as may occur after prolonged fevers and in chronic wasting diseases. The concentrate is of unquestionable value in cases where whole-meal bread is omitted from the diet.

To supplement the diet in partial deficiencies, a daily dose of 0.4 gramme of the concentrate is suggested. In the case of infants and young children 0.1 gramme or more, according to age, may be given daily. It may be dissolved and mixed in the baby's feedings, if so desired.

In serious conditions (beri-beri and late sprue), a daily dosage of 4 grammes, or even larger doses, of 'Ryzamin-B' may be given in safety, as excess of B vitamin orally has never been found toxic.

'Ryzamin-B' is a clear, golden-brown, syrupy preparation quite palatable and readily taken by children. A consistently high vitamin B₁ potency is assured by biological test. The product is issued by Burroughs Wellcome and Co. in collapsible metal tubes (with nozzle) of $\frac{1}{2}$ oz., from which the desired quantity can be expressed. A special measuring spoon is issued with each tube.

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